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Entomologist's Gazette

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ENTOMOLOGIST'S GAZETTE

October, 1956 Vol. 7, No. 4

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NEWS AND VIEWS

SUBSCRIPTIONS

Subscriptions for 1957 are now due and we would be particularly grateful to have them as soon as possible as this saves a great deal of time and money in sending reminders. The subscription is TWENTY-SIX SHILLINGS and a Subscription Form is enclosed herewith, together with a Bankers' Order Form for those who prefer to pay by this method.

During the year Mr. A. E. Gardner, F.R.E.S., has become my Co-Editor and I would like to express my gratitude to him. The present high standard of the publication is due in no small measure to the sustained hard work which he has put in ever since he first joined the Editorial Panel in January 1953. E. W. CLASSEY

BOOK REVIEW

Die Naturkundliche Reihe, by Hermann Märker (n.d.). Illustrated by Fritz Ludwig Schmidt. Three volumes. *Europäische Nachtfalter,* 79 pp., 24 coloured plates. *Europäische Tagfalter,* 64 pp., 24 coloured plates. *Exotische Tagfalter,* 48 pp., 24 coloured plates. Price 19s. per volume.

These three most attractively bound books have been written for the entomological novice and those attracted by good coloured illustrations. The text, in easily read modern type, has apparently been written as a medium to facilitate the publication of the plates, the artistic quality of which has been enhanced by a faint line background illustrating the food-plants of the species portrayed. These plates are beautifully produced, although the quality varies, the butterflies being of a very high standard, whereas some of the moths are mediocre. It is disappointing to find several plates with moths arranged in a continuous procession round the plate. This is a most antiquated and irritating practice, with no scientific or æsthetic value. The plates are printed on detached cards contained in a pocket on the inside of the back cover.

The text is restricted to brief descriptions of the species illustrated, and gives date of flight, geographical distribution, food-plants, stage of overwintering and a description of the imago, larva and pupa. With such excellent drawings the description of the imago is usually superfluous. A number of inexcusable errors in spelling of names occur. Specific names, more often than not, begin with capitals, and authors are frequently omitted. *Parnassius mnemosyne* L. occurs twice, with two different spellings, both incorrect—*menemosyne* and *minemosyne*. Similar errors occur with other species. The use of abbreviations for authors' names is very haphazard, 'P' being used for both Pallas and Poda, and 'R' and 'Rott." for Rottemburg. The name of the species at the head of each section is sometimes the beginning of the first paragraph and sometimes a pure heading. Such inconsistency tends to engender a prejudice against the author.

There is, nevertheless, much useful and interesting information. We are reminded that England is not the only country in which species of lepidoptera suffer extermination. Some subspecies of *Parnassius apollo* L. have become extinct due to overcollecting, and even *Aporia crataegi* L. is relatively scarce in parts of Germany owing, it is believed, to the eradication of blackthorn hedges and the greater care given to fruit trees.

As gifts for the not-too-serious entomologist, these enchanting volumes are ideal and should have a wide appeal, particularly in Germany.

F.T.V.

CELERIO NICAEA (DE PRUN.)*: A HAWK MOTH NEW TO THE BRITISH LIST

By C. WILKINSON

On the Devon coast on the morning of 20th August, 1954, I found a nearly full-grown and very conspicuous hawk moth larva on some Yellow Toadflax (*Linaria vulgaris*). It was nearly five inches long and was a greyish colour with a row of deep yellow blotches along each side bordered with black. The head was a pale colour with black mottlings, and the horn was rough and black.

A thorough search was made in the area for further specimens, and one more was found, also on Toadflax, about a yard from where the first was discovered. Both larvae continued to feed on Toadflax in captivity for a week and then pupated on the surface of the earth in flimsy cocoons made of dead leaves woven together with yellow silk. Each pupa was fully two inches long and was yellowish brown, though in one this darkened to almost black along the limbs and antennal edges.

The imagines emerged during the evening of 12th July, 1955, whilst I was away for a few days—hence the rather worn appearance of the specimen illustrated on Plate 7, Fig. 1. An illustration of the larva of *nicaea*, reproduced from Hofmann (1910), is shown in Fig. 2.

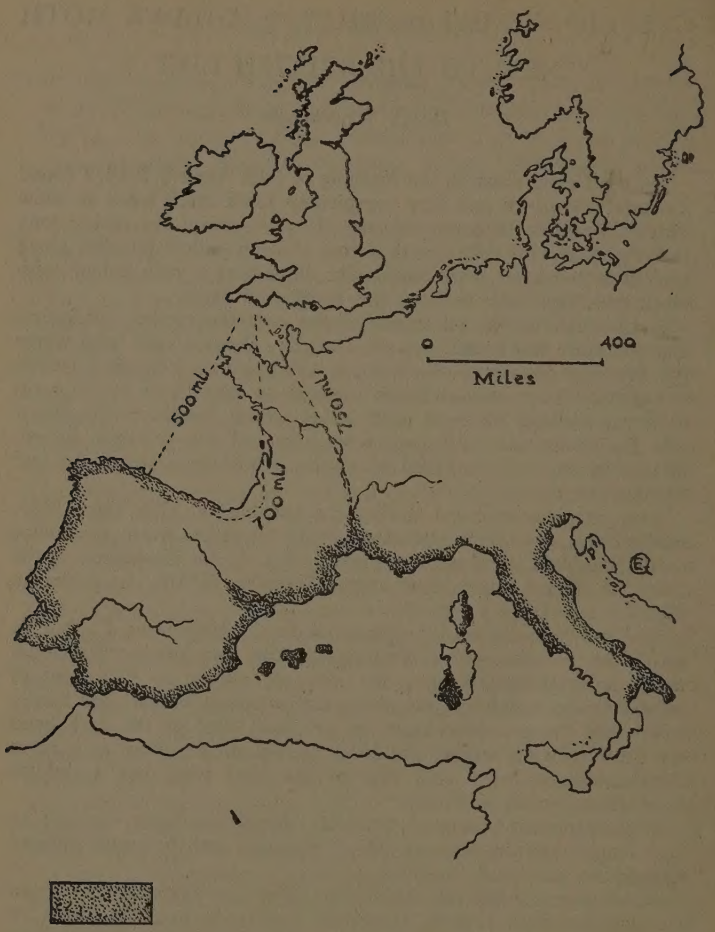
The moth is similar in appearance to *C. euphorbiae* L., but in *nicaea* the pulvillus is well developed and the first fore tarsal segment bears no prolonged spines; the legs are almost as pale beneath as above; the margins of the abdominal segments beneath are hardly paler than the ground colour; the proximal edge of the dark band on the fore wing reaches the hind margin of the wing at a more distal point, and the anal spot of the hind wing has a reddish tone (after Jordan *in* Seitz).

Both specimens proved to be males, though one larva was half an inch longer than the other at time of pupation and the pupae differed slightly in size and shading.

According to Seitz the distribution of *nicaea* extends from Spain through southern France, Italy and eastwards to Transcaspia to North-West India. The species apparently shows some geographical variation and several named forms are given in Seitz. Llomme states that the eggs are laid singly on *Euphorbia*, the most usual species being *esula*, but they have also been found on *characias, peplis, pilosa, nicaeensis, serrata* and *cyparissarias*.

This is believed to be the first time that *nicaea* has been noted

* *Sphinx nicaea* Leonardo de Prunner, 1798, Lepidoptera Pedemontana, page 86.



Distribution of *C. nicaea* in Western Europe, and possible lines of migration.

in the British Isles. The present record seems most likely due to a casual migrant having reached the South of England, either by flying the whole way or being accidentally carried on a passing ship, and then successfully producing some offspring. The nearest place where

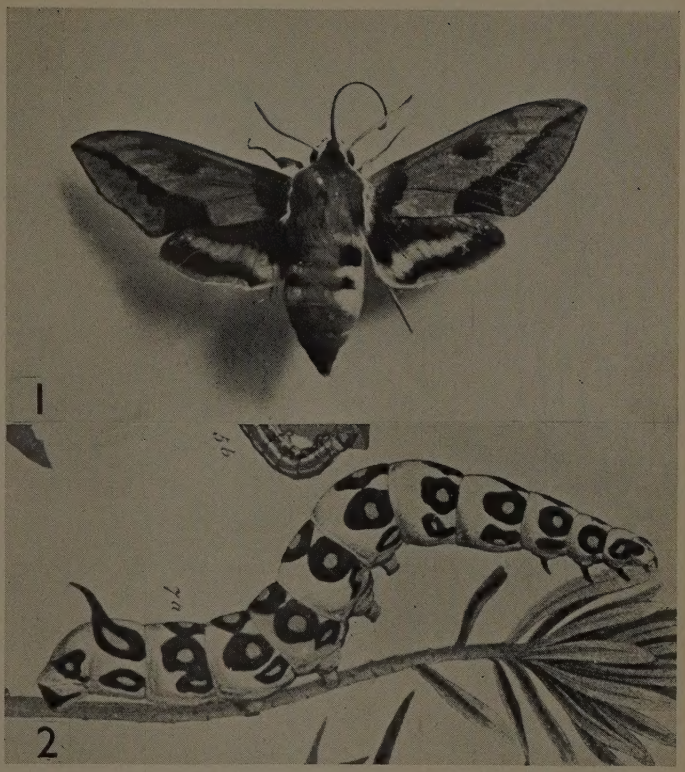


Fig. 1. A male *Celerio nicaea* (de Prun.) bred from larva taken in Devon.

Fig. 2. A reproduction of the larva of *C. nicaea* as illustrated in Hofmann, 1910, *Die Raupen Schmett. Europas,* ed. 2, plate 7, Fig. 7a.

nicaea occurs on the Continent is in the North of Spain, separated by more than five hundred miles of open ocean from Devon with only Finistère as a landfall in between. An alternative and perhaps more likely overland route would be along the Western seaboard of France and across the English Channel, a total distance of at least seven hundred miles. It seems less likely that it came from the South of France or Italy because of the barrier formed by the intervening Alps. (See map.)

There is at present no evidence that *nicaea* is continuing to breed in this country. A mercury vapour lamp was used for several weeks in July 1955 without result.

I am indebted to Mr. W. H. T. Tams, of the British Museum (Natural History), who kindly confirmed the identification of the two moths; and I should like to thank Mr. Chalmers-Hunt for his help with this article.

REFERENCES

JORDAN *in* Seitz, 1913. Macrolepidoptera of the World, Vol. 2.
LLOMME, LEON, 1923-35. Catalogue des Lépidoptères de France et de Belgique, Vol. 1.
HOFMANN, 1910. Die Raupen Schmett. Europas, ed. 2, plate 7, Fig. 7a.

LETTER TO THE EDITORS

A BIBLIOGRAPHY OF IRISH ENTOMOLOGY

Some years ago I prepared a bibliography of published papers and notes that deal with Irish insects or in which Irish insects are mentioned. This has not been published, but typescript copies have now been deposited in the libraries of the Royal Entomological Society of London, The Royal Irish Academy, and the National Museum of Ireland.

The bibliography was compiled by a page-by-page examination of the Irish and the chief British entomological and natural history journals. Series of 23 journals were examined. The period covered is from 1833 to 1948 for the Lepidoptera and to 1946 for the other orders. A few additional references, to local lists that were not published in journals and to some papers that appeared in journals other than those examined, are included. Over 3,500 titles are listed; 1735 of these refer to Lepidoptera. The numbers that appeared annually and possible reasons for fluctuations were discussed elsewhere (Beirne, *Irish Nat. Jour.* **9**: 81-4).

The items are listed in the bibliography under the order of insects to which each refers. Items that refer to insects of three or more orders are listed separately, with cross-references from the orders concerned. Within each order the items are listed alphabetically by the names of the authors. Each reference is annotated in that the counties from which the insects are recorded are listed and indications

are given if a paper or note mentions Irish insects without definite localities and if it mentions species or groups additional to those given in its title.

Many of the references could not be checked as the journals are not available here. Consequently the bibliography doubtless contains many errors, as well as some incomplete annotations. Nevertheless it may be of use to those interested in the insects of Ireland.

BRYAN P. BEIRNE.
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Belleville, Ontario.

BOOK REVIEW

Insect Communities, by Harold Bastin. 142 pages, 20 plates. Hutchinson, London, 1956. Price 15s.

A large number of books about the social insects has been published in recent years; some have brilliantly enriched our literature, a few have been execrable. Most of these books have concentrated either on bees, or ants or termites, but Mr. Bastin's book is all the more valuable because of its wide survey not only of the social insects proper, but also the gregarious ones. The original researches of von Frisch on bees have been a great stimulus to entomologists in many lands, and what has become a necessity is a general review of established knowledge about gregarious and social insects. O. W. Richards, in his 'Social Insects' supplied this want in masterly fashion as far as the social insects were concerned, but Mr. Bastin, extensively and less intensively, gives the general entomological reader sober information. The imperfect societies of flies, gnats, butterflies, beetles, dragonflies, aphides, locusts and cockroaches are discussed before the author goes on to deal in greater detail the rôle of insects as parents, showing how the instinctual rudiments of parental activity are the precursor to the complex patterns of nurturing manifested by the true social insects. In this category come the earwigs, bark-beetles, dung-beetles, and burying-beetles; amongst the Hymenoptera are the *Pompilidae* and *Sphegidae* and a wide variety of bees which are discussed most usefully at some length. Wasps, humble-bees, mosquito-bees and hive-bees, ants and termites make up the following chapters. Mr. Bastin has succeeded in drawing brief but effective descriptions, differentiating the life patterns and nesting habits of some of the more important species.

There are a few errors of spelling and of minor fact, and your reviewer does not take kindly to the use of so-called popular names of all the insects under discussion. These are trivial criticisms, however. The book has a definite place, as a little work of 'background' information, in what will surely be the major developments in entomological research in the coming years—amongst insect communities.

A. N. DRAYHAM.

THE ECOLOGY OF NORTH-EAST LANCASHIRE TRICHOPTERA

(WITH SPECIAL REFERENCE TO THE USE OF LIGHT AS A COLLECTING METHOD)

By ALLAN BRINDLE, F.R.E.S.

During the past two years I have collected the adults of the Caddis-flies of North-East Lancashire fairly intensively, using two main methods of collecting:—

(1) Sweeping.
(2) Light.

No attempt has been made to collect larvae or to rear them.

My primary aim was to compile a local list, forming one of a series of Insect lists for the area, but my interest in the order has developed along ecological and biological lines rather than pure taxonomy. The habitat preferences of the Caddis-flies are extremely varied, some species being found in a wide range of habitats, whilst others are very localized. Their swarming and 'dancing' habits also have shown great diversity, and these habits offer scope for continued observation and recording.

In this list therefore the species are arranged in habitat groups according to the following plan:—

Running Water

1. Waterfalls—in the sense of water running down inclined rocks, usually with a dense growth of moss.
2. Hill Streams—small, rapid streams, not more than 1-2 yards wide, 1-2 feet deep, and with a stony or gravelly bed.
3. Rivers—these are taken as the larger streams, still swift-flowing, with a stony or pebbly bed, and with no aquatic vegetation other than moss and algae.
4. Woodland Streams—small rivulets, fairly rapid but with emergent vegetation and well shaded by trees.
5. Slow Streams—occasional streams are found in this area with sandy or muddy beds, a slow current and a fair amount of aquatic vegetation (*Callitriche*, etc.).

Still Water

1. Moorland Pools—acid, with little vegetation apart from mosses (*Sphagnum, Hypnum,* etc.).
2. Ponds—neutral, fairly shallow, with considerable vegetation (*Callitriche, Potamogeton, Equisetum,* etc.).
3. Canal—a stretch of the Leeds and Liverpool Canal. Water usually a little fouled by coal dust, tin cans and other débris, but supporting a fair amount of vegetation (*Potamogeton*).
4. Reservoirs—stony shores, deep, with vegetation usually kept down by artificial means.

5. Marshes—some species are regularly taken in marshes, and there is usually some free water together with such plants as watercress, etc.

The only criterion for including a species in any one habitat is the fact that the adults have either been swept from neighbouring vegetation, or have been taken at light by the habitat.

The only exceptions to this have been the species taken at MV lamp at a distant from water—these are the confirmed wanderers, such as species of Stenophylax and Limnephilus. These are indicated by three asterisks in the lists. They are nevertheless included in what is considered their real habitat—the places where they are normally taken in any numbers.

The following abbreviations are used in the lists:—

* taken at Tilley lamp near the habitat;
** taken at MV lamp and Tilley lamp near the habitat;
*** taken at MV lamp at least a mile from nearest water;
(the omission of the * merely indicates that these species have not *so far* been taken at light—they may well be attracted to it).

l = local;
wd = widely distributed;
a = abundant;
c = common;
nc = not common;
fc = fairly common

(or combinations, e.g., lc = locally common).
Roman numerals indicate the months in which the adults have been taken.

Sweeping. Sweeping vegetation was carried out both by day and by night, the latter method being very productive, for then the insects have come up from the bases of the plants. It also deals with the more lethargic species—the ones for which light apparently is not so attractive. Both ground vegetation and trees were swept, the trees along the water's edge appearing to be much favoured.

Light. Two Tilley lamps were used in conjunction with white sheets, placed by the water's edge or as near as possible, and were lit from dusk to about 1 p.m. It was found that the Caddis-flies did not come to the lamps until well after dark. At dusk they disported themselves by swarming—performing complicated gyrations low over the water (*Molanna angustata*) or 'dancing' up and down in a gnat-like manner by the bank (*Mystacides longicornis*). Only when it had become completely dark did they allow themselves to come to the light. A white bulb with white sheets were used when the MV lamp was employed near water. Otherwise a black bulb with a trap was the standard method. This last method was used in the towns of Nelson and Great Harwood.

It is as well to extract the Caddis-flies soon after dawn from

the trap, otherwise some escape, and others damage themselves with their vain efforts to do the same.

The chief difficulty with this kind of a survey is to find the opportunities (i.e., time and weather) to work all suitable localities

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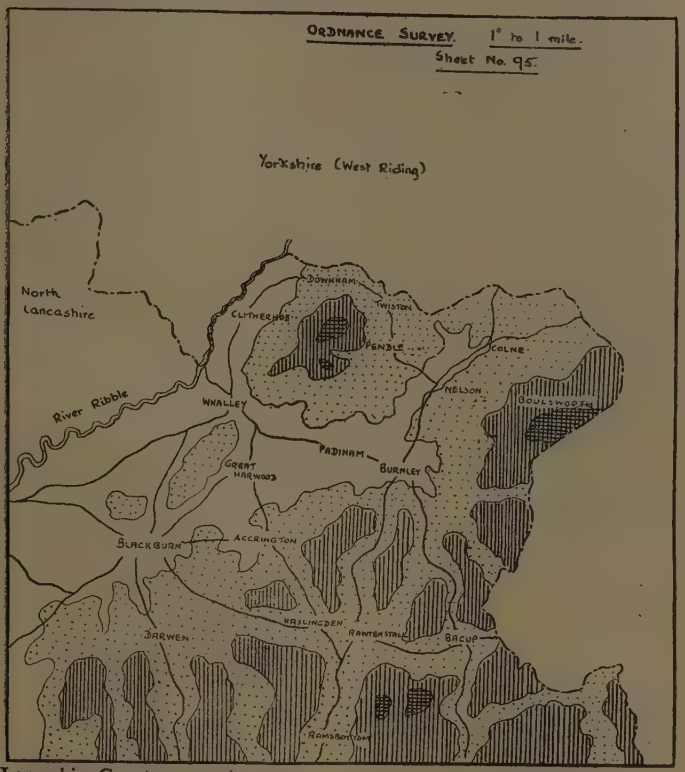


Lancashire County Boundary: ——·——·——

Land above 500 ft.:

Land above 1,000 ft.:

Land above 15,00 ft.:

Main roads:

Names printed are of towns, etc., with the exception of the two county names and of Pendle and Boulsworth which apply to the hills.

throughout the year. Omissions are inevitable, but these should be covered in the future.

Since only adults were taken, it is not considered that this list is free from flaws, and I should be very interested to learn from other Trichopterists their views on any of the species. The division of habitats also is purely tentative, and further work may amend them. In this area, however, no true lowland river stretches occur (the slow, meandering, vegetation-filled stretches of the south, etc.). The streams with a slow current at all are very scarce.

The area of North-East Lancashire forms part of Vice County 59, and follows the County Boundary on the east and most of the Northern side. From Whalley our boundary follows the south bank of the Ribble to Balderstone. The western and southern boundaries follow, quite arbitrarily, the edges of Sheet 95 of the Ordnance Survey. It includes part of the Lancashire plain and the western slopes of the Pennines, with land from 300 feet up to 1,800 feet. As a result most of our rivers are fast-flowing, and since the average rainfall is about 45 inches they are seldom short of water.

Lepidopterists who run a MV lamp regularly could help the Trichopterist immensely, especially if they are near to suitable habitats. They could elucidate some of the apparent mysteries of irregular emergences. Some species seem to emerge throughout the summer, particularly common species, whilst others appear to have two distinct broods. Constant surveys of the Caddis-flies by means of a MV lamp would do much to establish the true position. If any Lepidopterists care to co-operate I would be happy to forward boxes (with packing and stamps) for the reception of any Caddis-flies they care to forward on.

The list of species so far recorded from North-East Lancashire in 78, about 41% of the British species.

List of Species, arranged in habitat groups (some appear in more than one):—

RUNNING WATER

1. WATERFALLS

Crunoecia irrorata (Curt.)	lc.	VII
Beraea maurus (Curt.)	c. wd.	VII
Tinodes assimilis McLach.	l.	VII
T. unicolor (Pict.)	l.	VII–VIII

2. HILL STREAMS

****Stenophylax stellatus* (Curt.)	c. wd.	VII–IX
***S. latipennis* (Curt).	lc.	VIII–IX
***Drusus annulatus* (Steph.)	lc.	VII–IX
Chaetopteryx villosa (F.)	l.	VIII–X
Silo pallipes (F.)	c. wd.	VI–VII
S. nigricornis (Pict.)	l.	VIII
**Odontocerum albicorne* (Scop.)	lc.	VII
**Hydropsyche instabilis* (Curt.)	c. wd.	VI–VIII

**Plectronemia conspersa* (Curt.)	c. wd.	VI–VIII
Philopotamus montanus (Don.)	c. wd.	IV. VII–VIII
****Rhyacophila dorsalis* (Curt.)	c. wd.	VI–IX
Agapetus fuscipes Curt.	c. wd.	VI–VII

3. RIVERS

***Asynarchus coenosus* (Curt.)	l.	VIII–IX
****Stenophylax stellatus* (Curt.)	c. wd.	VII–IX
***S. latipennis* (Curt.)	lc.	VIII–IX
****S. permistus* McLach.	fc. wd.	V–VI
***Micropterna sequax* McLach.	fc. wd.	VI–VII. IX
***Halesus radiatus* (Curt.)	c. wd.	IX–X
***H. digitatus* (Schr.)	c. wd.	IX–X
Ecclisopteryx guttulata (Pict.)	nc. l.	VI
Leptocerus bilineatus (L.)	l.	VI–VII
**Mystacides azurea* (L.)	c. wd.	VI–VIII
**Hydropsyche instabilis* (Curt.)	c. wd.	VI–VIII
**Plectronemia conspersa* (Curt.)	c. wd.	VI–VIII
**Polycentropus flavomaculatus* (Pict.)	c. wd.	VI–VII
P. multiguttatus (Curt.)	l.	VIII
Cyrnus trimaculatus (Curt.)	l.	VII
Tinodes dives (Pict.)	l.	VI. VIII
**Psychomyia pusilla* (F.)	a.	VII
****Rhyacophila dorsalis* (Curt.)	c. wd.	VI–IX
R. munda McLach.	l.	IX–X
Glossosoma boltoni Curt.	lc.	VI
Agapetus fuscipes Curt.	c. wd.	VI–VII
**A. comatus* (Pict.)	l.	VII
**Hydroptila sparsa* Curt.	c. wd.	VIII

4. WOODLAND STREAMS

Beraea maurus (Curt.)	c. wd.	VII
Diplectrona felix McLach.	lc.	VII
Tinodes assimilis McLach.	l.	VII
T. unicolor (Pict.)	l.	VII–VIII
Wormaldia occipitalis (Pict.)	lc.	IV. VI–IX
W. subnigra McLach.	l.	VIII
Rhyacophila obliterata McLach.	lc.	V. IX–X

5. SLOW STREAMS

***Glyphotaelius pellucidus* (Retz.)	l.	VI–IX
Sericostoma personatum (Sp.)	l.	VI–VII
Goera pilosa (F.)	fc. wd.	VI–VII
Hydropsyche angustipennis (Curt.)	lc.	VII

STILL WATER

1. MOORLAND POOLS

Neuronia ruficrus (Scop.)	l.	VI

2. PONDS

****Phryganea striata* L.	c. wd.	VI
***P. varia* F.	l.	VI–IX
**P. obsoleta* Hagen	l.	VII–VIII
***Glyphotaelius pellucidus* (Retz.)	l.	VI–IX
****Limnephilus rhombicus* (L.)	c. wd.	V. VII–IX
***L. flavicornis* (F.)	nc. l.	VII
****L. marmoratus* Curt.	fc. wd.	VII–VIII
****L. lunatus* Curt.	c. wd.	VII–VIII. X

***L. centralis* Curt.	c. wd.	VI–VIII
***L. vittatus* (F.)	fc. wd.	V–VII. IX
L. auricula Curt.	fc. wd.	V–VII
L. extricatus McLach.	c. wd.	VI–VII
L. luridus Curt.	nc. l.	VI–VII
***L. sparsus* Curt.	c. wd.	VI–IX
**Anabolia nervosa* (Curt.)	c. wd.	VII. VIII–X
Molanna angustata (Curt.)	a. wd.	VII–VIII
Leptocerus fulvus (Ramb.)	l.	VII–VIII
L. senilis (Burm.)	l.	VII
L. aterrimus Steph.	a. wd.	VII
Mystacides azurea (L.)	c. wd.	VI–VIII
M. longicornis (L.)	la.	VI–VII
**Oecetis ochracea* (Curt.)	c. wd.	VII–VIII
Holocentropus picicornis (Steph.)	l.	VI–VIII
Cyrnus flavidus McLach.	c. wd.	VII–VIII
Tinodes waeneri (L.)	a. wd.	VI–VIII
Lype phaeopa (Steph.)	lc.	VII–VIII
Agraylea multipunctata Curt.	c.	VIII
A. pallidula McLach.	fc.	VIII
Ithytrichia lamellaris Eat.	fc.	VIII
Oxyethira costalis (Curt.)	c.	VIII

3. CANAL

Phryganea grandis L.	c.	VI
Limnephilus extricatus McLach.	c. wd.	VI–VII
**Oecetis ochracea* (Curt.)	c. wd.	VII–VIII
Tinodes waeneri (L.)	a. wd.	VI–VIII
**Lepidostoma hirtum* (F.)	l.	VII

4. RESERVOIRS

***Limnephilus rhombicus* (L.)	c. wd.	V. VII–IX
**L. flavicornis* (F.)	l.	VII
***L. marmoratus* Curt.	fc. wd.	VII–VIII
***L. lunatus* Curt.	c. wd.	VII–VIII. X
***L. centralis* Curt.	c. wd.	VI–VIII
Molanna angustata (Curt.)	a. wd.	VII–VIII
Leptocerus fulvus (Ramb.)	l.	VII–VIII
L. cinereus Curt.	l.	VII
L. albifrons (L.)	l.	VIII
Mystacides longicornis (L.)	la.	VI–VII
**Oecetis ochracea* (Curt.)	c. wd.	VII–VIII
O. lacustris (Pict.)	lc.	VII
Neureclipsis bimaculata (L.)	l.	VIII
Cyrnus flavidus McLach.	c. wd.	VII–VIII
Tinodes waeneri (L.)	a. wd.	VI–VIII

5. MARSHES

Colpotaulius incisus (Curt.)	l.	V–VII
***Limnephilus centralis* Curt.	c. wd.	VI–VIII
***L. vittatus* (F.)	fc. wd.	V–VII. IX
Stenophylax alpestris Kol. (High moorland marshes only)	l.	VI–VII

SOME FURTHER NOTES ON THE MACROLEPIDOPTERA OF A SOUTH WESTMORLAND PARISH

By The Reverend J. H. VINE HALL, B.D., A.K.C.

The following notes are intended to bring my previous articles on the subject (1954 *Ent. Gaz.* **5**: 125-134 and 243-4) up to date, and to add a few comments thereon.

The general impression seemed to be that 1955 was a poor year in spite of wonderful weather from the beginning of July onwards. No doubt the damage to insects was caused not by the severe winter weather of February and March, but by the extraordinarily bleak and cold May, coming at a time when hibernation had been brought to an end by a spell of fine mild weather in the latter half of April. In this parish practically no species reached the level of abundance which had obtained in the previous three years since observations began here, and several species, normally often seen, have not put in any appearance at all. Nevertheless there are some additions to make to the list of species recorded from this parish previously. First, two species were formerly overlooked. Dr. N. L. Birkett, of Kendal, has kindly examined the genitalia of many specimens of the genera *Procus* and *Hydraecia,* and he has definitely confirmed that *Procus latruncula* (Schiff.) occurs sparingly among large numbers of *strigilis* (Clerck), and that *Hydraecia lucens* Freyer occurs along with *H. oculea* (L.). These should, of course, have appeared in the previous lists. Dr. Birkett (1956, *Entomologist,* **89**: 20-21) has also established that *Hydraecia crinanensis* Burrows is to be found within ten miles of here, and it will probably be found eventually in my mercury vapour trap. The following species are additions to the list during 1955: —

April 30: *Nothopteryx carpinata* (Borkh.). Two at m.v.
May 30: *Panemeria tenebrata* (Scop.). One flying in a lane.
June 28: *Leucania comma* (L.). One at m.v.
July 14: *Apatele megacephala* (Schiff.). One at m.v.
July 20: *Plusia interrogationis* (L.). One at m.v.
July 26: *Caradrina blanda* (Treits.). One at m.v.
Sept. 12: *Gortyna flavago* (Schiff.). One at m.v. and another on Sept. 16.
Sept. 20: *Dasypolia templi* (Thunb.). One at m.v. and another on Oct. 31. (See 1956, *Ent. Rec.,* **68**: 27.)
Sept. 21: *Anchoscelis litura* (L.). One at m.v.
Sept. 22: *Peridroma porphyrea* (Schiff.). One at m.v. and several more up to Oct. 23.
Oct. 11: *Nycterosea obstipata* (Fabr.) Two at m.v. and another the following night.

This makes a total of 343 Macrolepidoptera recorded from this parish in the four years 1952-5 inclusive. Of these 25 are butterflies, leaving 318 moths. Of the moths 11 were seen only by day, leaving 307 seen at mercury vapour light. It is interesting to compare these figures with (a) the local lists, and (b) Dr. Birkett's personal records from Kendal. In both cases only the moths will be dealt with.

(a). The local lists have never been published. They exist only in typescript and manuscript, and are in the possession of Dr. Birkett. Omitting certain casual migrants and a few species which are highly improbable and the records of which are old and entirely unconfirmed, there are 145 species recorded which have not so far been seen at Hutton Roof. These lists cover not only South Westmorland proper, but include the major part of the Furness district of Lancashire, which geographically belongs to Westmorland, and also give some records from the first few miles over the border into the main portion of Lancashire as far as Silverdale and Warton, which also geographically is identical with the neighbouring part of South Westmorland. The county boundaries are extremely awkward around here from the point of view of Natural History, and that accounts for the excursions of local lists into neighbouring counties. Interpreting Westmorland in the above sense, I myself can vouch for the occurrence of 24 of the 145 species not recorded from Hutton Roof so far, and increasing the area still more, to stretch from the Craven Pennines to the Cumberland coast, I can vouch for the occurrence in this general area of 41 of them, a good few of which could not possibly occur in this parish except as casual wanderers. That leaves 104 species of moths recorded locally which I have not personally encountered in the field.

(b). My lists show 62 species which Dr. Birkett has not recorded from Kendal. He operates his mercury vapour trap in his garden on the outskirts of the town in a low-lying and sheltered neighbourhood, and has been working it for considerably longer than mine has been in operation. Of these 62 there are eight which have only been seen by day, and so 54 species have actually appeared at my mercury vapour light which he has not so far recorded from his light. On the other hand he has recorded 28 species which have so far not appeared here. A list of them may be of some interest. They are:—*Notodonta anceps* (Goeze), *Odontosis carmelita* (Esp.), *Tethea fluctuosa* (Hubn.) (one only), *Cybosia mesomella* (L.), *Apatele menyanthidis* (View.), *Actebia praecox* (L.), *Hadena suasa* (Schiff.) (one only), *Hadena conspersa* (Schiff.), *Caradina morpheus* (Hufn.) (frequent), *Apamea ophiogramma* (Esp.) (frequent), *Apamea sublustris* (Esp.) (one only), *Mormo maura* (L.), *Phalaena typica* (L.), *Celaena haworthii* (Curt.), *Hydraecia crinanensis* (Burrows), *Hydraecia petasitis* (Doubl.), *Leucania conigera* (Schiff.) (frequent), *Enargia paleacea* (Esp.) (one only, taken at another light in the town, but personaliy seen by him—a striking record), *Pyrrhia umbra* (Hufn.),

Scoliopteryx libatrix (L.), *Hemithea aestivaria* (Hubn.), *Sterrha dimidiata* (Hufn.), *Calocalpe cervinalis* (Scop.), *Xanthorhoë spadicearia* (Schiff.), *Hydrelia flammeolaria* (Hufn.), *Eupithecia linariata* (Schiff.), *Orthonama lignata* (Hubn.), *Erannis leucophaearia* (Schiff.) (frequent). This list clearly reflects the fact that he is nearer to the heather moorlands and hill bogs and damp woodlands than I am. It also reflects his proximity to the River Kent, which becomes tidal not many miles downstream. Dr. Birkett can vouch personally for the occurrence of 43 species from this area (interpreted as above) which I have so far not seen myself in the field. The list just given includes 19 of these, for, though I have seen his specimens, I have not met with the living insect.

The above statistics reveal 62 species for which neither Dr. Birkett nor I can yet give confirmation from our own work. Many of these records are perfectly authentic, for specimens taken by former local collectors are in Kendal Museum or in other places. There are several, however, for which confirmation is badly needed, and perhaps that confirmation will be eventually forthcoming. It is by no means impossible that species not yet in the local lists may be discovered, for South Westmorland includes a great deal of wild and remote country. There is plenty—indeed, far too much—to keep one busy for a good many years to come.

Hutton Roof Vicarage,
5th January, 1956.

NOTE ADDED IN PROOF

Additions to the Hutton Roof list to date (30th July, 1956).

25th April: *Scoliopteryx libatrix* (L.). One at m.v.

22nd May: *Cucullia verbasci* (L.). One at m.v.

1st June: *Eupithecia distinctaria* H-S. One at m.v.

11th June: *Hadena conspersa* (Schiff.). One at m.v. and two more the following night.

12th June: *Eupithecia linariata* (Schiff.). One at m.v. and two more on subsequent nights.

23rd June: *Scopula remutaria* (Hueb.) (*floslactata* (Haw.)). One at m.v.

25th June: *Hadena suasa* (Schiff.). One at m.v.

28th June: *Dyscia fagaria* (Thunb.). One at m.v.

4th July: *Caradrina morpheus* (Hufn.). One at m.v.

14th July: *Cerura furcula* (Clerck). One at m.v.

29th July: *Hemithea strigata* (Müll.) (*aestivaria* (Hueb.)). One at m.v.

There are now 55 species in the South Westmorland List which still require personal verification by Dr. Birkett or myself.

THE BRITISH SPECIES OF THE AGONUM SUBGENUS EUROPHILUS (COL: CARABIDAE)

By F. D. Buck

The characters used in the construction of keys in this subgenus are often vague and ill-defined, some are quite unreliable. Though underside characters are not popular with coleopterists, it is felt that the prosternal process and the mes-episterna may satisfactorily separate some of the species. The lateral margin of the prosternal process referred to in the key below is similar to the lateral margin of the pronotum external to the explanate margin.

1 (2) Pronotum apparently quadrate (very slightly transverse when measured) (Fig. 1); prosternal process shagrenated and broad (Fig. 7) ..... *thoreyi* Dej.

2 (1) Pronotum distinctly transverse (Figs. 2, 3 and 4); prosternal process if shagrenated narrow (Fig. 8) 3

3 (6) Prosternal process shagrenated 4

4 (5) Form broader; pronotum more rounded at sides, widest in front of middle, explanate margin wider towards base (Fig. 3); elytra broader and more rounded at sides (Fig. 5) ..... *scitulum* Dej.

5 (4) Form narrower; pronotum less rounded at sides, widest at middle, explanate margin not or very little wider towards base (Fig. 4); elytra narrower, less rounded at sides (Fig. 6) ..... *piceum* (L.)

6 (3) Prosternal process smooth and shining 7

7 (8) Prosternal process strongly convex, margin sharply defined (Fig. 9) ..... *micans* (Nic.)

8 (7) Prosternal process not strongly convex, margin less sharply defined (Figs. 10 and 11) 9

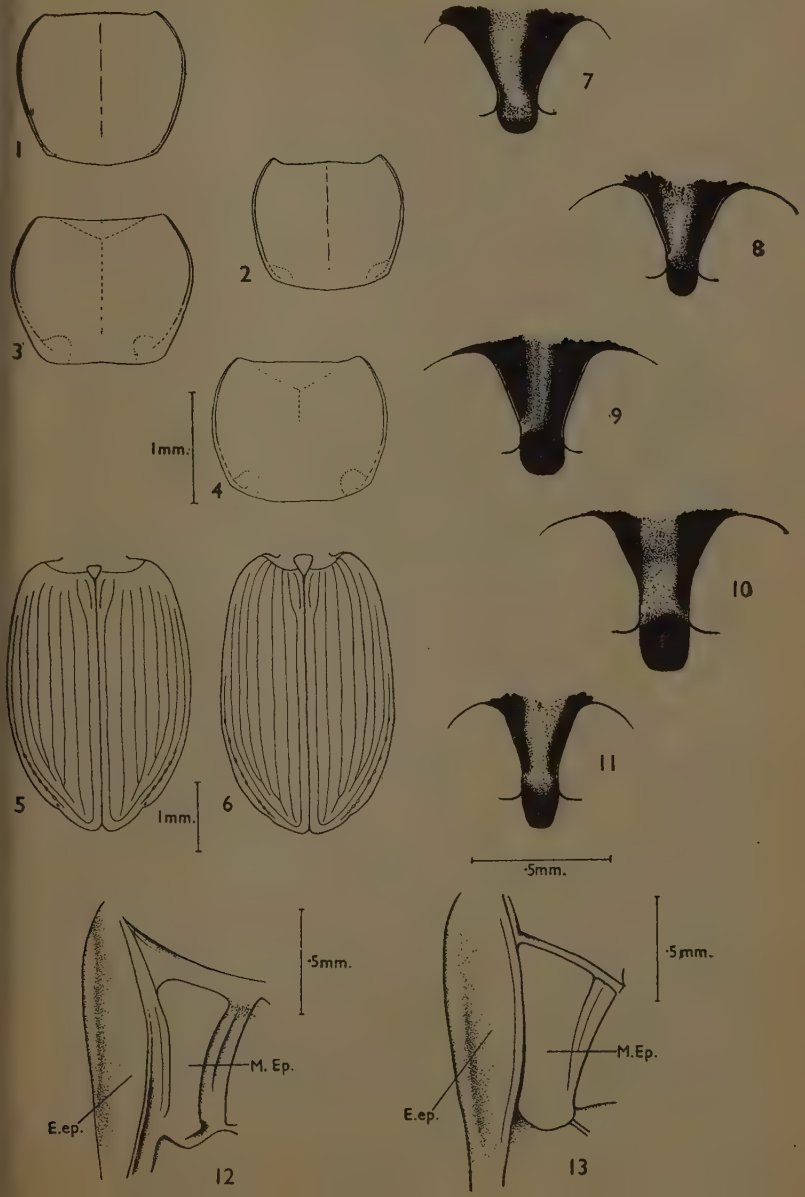
9 (10) Mes-episterna narrow (Fig. 12); prosternal process broader (Fig. 10) ..... *fuliginosum* (Panz.)

10 (9) Mes-episterna broader (Fig. 13); prosternal process narrower (Fig. 11) ..... *gracile* (Gyll.)

I should like to express my thanks to Mr. R. D. Weal for supplying specimens of *Agonum scitulum* Dej. from the West collection for my examination and to Miss R. M. Piggott who typed this manuscript.

EXPLANATION OF FIGS. 1-13

Figs. 1-4, Pronotum of (1) *Agonum thoreyi* Dej.; (2) *A. gracile* (Gyll.); (3) *A. scitulum* Dej.; (4) *A. piceum* (L.). Figs. 5 and 6, Elytra of (5) *A. scitulum* Dej.; (6) *A. piceum* (L.). Figs. 7-11, Prosternal process of (7) *A. thoreyi* Dej.; (8) *A. piceum* (L.); (9) *A. micans* (Nic.); (10) *A. fuliginosum* (Panz.); (11) *A. gracile* (Gyll.). Figs 12 and 13, Mes-episterna of (12) *A. fuliginosum* (Panz.); (13) *A. gracile* (Gyll.). E. ep. Elytral epipleura. M. Ep. mes-episterna.


1
2
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13

NOTES ON THE FAMILY AGROMYZIDAE (DIPT.)

By G. C. D. GRIFFITHS, F.R.E.S.

(1) The Occurrence in Britain of *Phytomyza cecidonomia* Hg.

Hering (1949) described a *P. cecidonomia* whose larvae feed in the swollen midribs at the base of the leaves of *Hypochaeris radicata* L. The puparia remain well inside the midrib. They can easily be collected by ripping the midrib open.

At Westerham (Kent), 19-9-54, while attending a field-meeting of the South London Entomological & Natural History Society, a gall was found on *Hypochaeris radicata* L. which produced a fly on 11th October. This specimen, however, did not agree with Hering's description, and was thought to be a new species. But since then a series has been bred from Chiddingfold (Surrey), 22-5-55. Comparison of genitalia and larval preparations has shown that the German and British specimens are probably conspecific. But the characters based on size and colour given by Hering in his emendation of Hendel's (1931-6) key do not hold good. The species, in the British form, is difficult to distinguish from *P. affinis* Fall. It will now be described, and Hering's new emendation to Hendel's key given.

Phytomyza cecidonomia **britannica** ssp. nov.

Head:

Frons 2½ times the width of an eye posteriorly, 2 times at the level of the antennae, a little broader than long. Ratio of the width of the lunule over the distance from the front of the lunule to the fore-ocellus, 1.3. Lunule evenly rounded, semicircular. Ocelli form a triangle whose sides are slightly shorter than its base, the apical angle being about 80°, base about 1/4 of width of frons. 2 ors, the 2nd about as long as 1st, directed posteriorly; 2 ori, the 2nd about 1/3 as long as 1st, directed more inwards. 2nd ori nearer 1st ori than is 2nd ors: space between 1st ori and 2nd ors about equal to that between 1st and 2nd ors. Space between 1st ors and vti much greater. 2nd ors at middle of frons. Orbital setae in an irregular row from 1st ors to 2nd ori, c.8 in all. Oc reaches 1st ori. Cheeks and orbits clearly visible in Profile; about width of 1st antennal segment in front view. Jowls 2/5 of the height of eye. Eyes oval, higher than wide, with scattered pubescence, longer than in *affinis* Fall. Antennae separated basally by less than the width of their 1st segment: 3rd segment rather short with fine pubescence. 3-4 peristomal bristles, 1 vibrissa.

Thorax:

3+1 strong dc., the 4th before the prs. i.pa.c.½ e.pa. acr 2-rowed, reaching 2nd dc.; c.4 pairs in all, 2 before and 2 after the prs. Mesopleuron with 1 strong and 2 weaker bristles.

Abdomen (♀):

Basal cone of ovipositor pubescent in basal 2/3, a little longer than 6th tergite, which is slightly longer than the 5th.

Wing:

2nd costal segment 2½ times as long as 4th. r_{4+5} straight, diverging from m_{1+2}.

Size:

Body 1.8 mm. Wing 2.2 mm.

Colour:

Frons, cheeks and jowls pruinose-yellow. Face yellow, slightly darkened on either side of middle keel. Ocellar triangle and base of pvt shining black. Palpi black. Occiput black, this colour reaching as far as bases of vti; but a pair of yellowish bands continues from the frons down the back of the head. Antennae with 1st segment yellow, 2nd blackish brown, 3rd black with whitish pubescence. Thorax and scutellum pruinose grey: humeral and postalar calli very slightly yellow marked. Mesopleuron very narrowly yellow dorsally and posteriorly. Pteropleuron anteriorly and hypopleuron dorsally yellow rimmed. Halteres yellow. Wing base yellow. Squama yellow with black fringe. Abdomen shining black with bright yellow hind margins to segments. Trochanters yellow tipped. Tips of femora and bases of tibiae bright yellow. Tips of tarsal segments slightly yellow. Legs otherwise shining black.

Type ♀ taken as a larva at Westerham, Kent, 19.9.54, on *Hypochaeris radicata* L. Imago emerged 11th October. Nine Paratypes bred from Chiddingfold, Surrey, 22.5.55: emerged 5th-25th June.

Hendel's key should be emended in the following way:

151c. 1. Fühlerglied gelb, das 2. gelbbraun. Palpen bräunlichgelb. ..... **cecidonomia** Hg.

– Palpen und 2. Fühlerglied schwarz ..... 151d.

151d. Hinterer Augenrand im oberen 1/3 schwarz, grau bestäubt. Kleinere Arten, Flügellänge höchstens 2.3 mm. 2. Randabschnitt 2 – 2½ mal so lang wie der 4 ..... 151e.

– Hinterer Augenrand oben gelb, mit ± grauer Bestäubung. Das Schwarz des Hinterkopfes erreicht nicht den Augenrand. Grössere Arten, Flügellänge wenigstens 2.5 mm. und mehr. 2. Randabschnitt 2 – 3 mal so lang wie der 4. ..... 151g.

151e. Pubeszenz-Härchen am Vorderrande des 3. Fühlergliedes lang, rauh, deutlich stark gekrümmt. 2. ors *vor* der Stirnmitte, von vti weiter als von der Fühlerwurzel entfernt ..... 151f.

– Pubeszenz-Härchen am Vorderrande des 3. Fühlergliedes ganz kürzer, wie geschoren, dicht und gerade. 2. ors *in* der Stirnmitte, von vti und Fühlerwurzel gleichweit entfernt. 2 gelbe Streifen von der Stirnstrieme neben der Ocellarplatte über den Vertex auf den

Hinterkopf fortgesetzt. Lunula so hoch wie ein Halbkreis. (Galle an Hypochaeris) ..... **cecidonomia britannica** ssp. nov.

151f. Mine interparenchymal. Pupar normal gelbweiss (dunkel nur wenn abgestorben oder parasitiert), Hinterstigmenträger wenig vortretend, ihre Basen breit und flach getrennt. (An Cirsium, Centaurea, Carduus, Onopordon und Serratula) ..... **affinis** Fall.

– Mine oberseitig. Pupar stets dunkelbraun. Hinterstigmenträger stark vortretend, sich fast berührend, nur durch eine linienschmale Furche getrennt. (An Centaurea und Onopordon, nur in Oktober). ..... sp. (undescribed).

The undescribed species inserted in the key above cannot be distinguished from *affinis* Fall., in the adult stage. It will be described from the larva at some future date.

Besides the above-mentioned characters, *cecidonomia* Hg. may also be distinguished in the female by the extent of the pubescence on the ovipositor. The German specimen which Prof. Hering has very kindly given me agrees with his description. It is larger (2.3 mm. body-length), and paler in coloration. The 2nd antennal segment is clearly yellowish; the acrostichals are weaker; and the eye-pubescence is almost completely absent.

(2) *Agromyza johannae* de Meij., from *Ulex europaeus* L.

Agromyza johannae de Meij. has hitherto been known in Britain only from *Sarothamnus scoparius* (L.) Wimner. On 31st July, 1955, on Horsell Common, Surrey, young seedlings of *Ulex europaeus* were found which had Agromyzid larvae feeding in their leaves. As no Agromyzid had been hitherto known from this plant, some larvae were preserved in alcohol. Prof. Hering has examined these and states that he cannot distinguish them from the larvae of *A. johannae* de Meij. on Broom.

It remains to be seen whether the mature plant of *Ulex europaeus* can support Agromyzids. The vegetative leaflets which occur at the bases of the shoots should afford a similar environment to the leaflets of seedlings before they develop into spines.

(3) *Additions to the British List.*

An authoritative list of the British Agromyzidae has at last been published by Spencer (1956). The following additions to it are to be noticed.

Liriomyza tanaceti de Meij.: Several specimens were swept by Mr. Spencer and the author from *Tanacetum vulgare* L. in the marshes near Godalming, Surrey, 7.8.55. There is therefore no longer any doubt about its status as a British species.

Phytomyza anemones Hg.: Larvae of this and another unidentified species were taken in *Anemone nemorosa* L., at Chailey, Sussex, 30.5.54. Adults emerged 2.4.55, 6.4 & 6.6. The red puparium with long hind spiracles is very characteristic.

P. sisonis Hg.: Bred from puparium on *Sison amomum* L., Betchworth, Surrey, 14.8.55. The species is doubtfully distinct from *chaerophylli* Kalt.

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13 Woodlands Avenue,
Finchley, London, N.3.
24th February, 1956.

BOOK REVIEW

Gall Midges of Economic Importance, Vol. VII: CEREAL CROPS, by H. F. Barnes, M.A., Ph.D., London. Crosby Lockwood & Son Ltd., 1956. pp. 261. Cloth. Price £1 1s.

Dr. Barnes deals with the gall midges injurious to wheat, barley, oat and rye, the sorghums, the panicum millets, and to paddy or rice.

This book maintains the very high standard of the previous six volumes in the series on gall midges of economic importance. All the essential information is presented in a characteristic, clear and concise manner. This volume includes a valuable bibliography comprising 526 references, while lists of the most important references are given in many of the sections dealing with individual midges. Three separate indices dealing with midges, plants and general items respectively add to the volume's value as an indispensable work of reference.

The author's preface is no mere formality, but is used to draw attention to matters of general biological interest as illustrated by the gall midges of cereal crops. Such biological phenomena as diapause and the occurrence of unisexual families are dealt with, and attention is called to the importance of an intimate knowledge of a pest's bionomics and the use of phenological data in avoiding serious crop infestations. Dr. Barnes points out the need for more qualified entomologists to work on gall midges and the vital importance of close co-operation between entomologists, agronomists, plant breeders and others to ensure that knowledge won by patient and careful work is used to save an enormous wastage of food.

Vol. VIII will deal with gall midges whose larvae are zoophagous and fungivorous, those living on certain weeds, Addenda and Corrigenda to Volumes I-VIII, and a comprehensive section on the identification of gall midges, and we look forward to its publication.

S. A. MANNING.

THE LARVA OF *LIMNEPHILUS MARMORATUS* CURTIS (TRICHOPTERA: LIMNEPHILIDAE)

By HILMY M. HANNA, B.Sc., M.Sc., F.R.E.S.
(Zoology Department, University of Reading)

On 3rd June, 1953, 146 larvae were collected from an open pool at Heaton Mersey, near Manchester. The larvae were found on the aquatic vegetation as well as on the bottom of the pool. The adults started to emerge in the laboratory on 25th June and were identified as *Limnephilus marmoratus*.

The Lancashire larvae were checked against specimens collected from the Kennet Canal and the Basingstoke Canal in the Reading area. The following details are derived from the study of a large number of fully grown specimens.

Case:

The cases are up to 27 mm. in length and 8 mm. in width, and are generally built of stalks of water plants arranged transversely or obliquely. Elodea leaves, sand grains and mollusc shells may be included in the case. Cases built entirely of seeds of water plants are also common. On some of the cases specimens of a fresh-water sponge (probably *Spongilla*) were found. The posterior opening of the case is small and lies in the middle of a silken membrane.

Larvae:

The larva is eruciform. The larvae examined are up to 28 mm. long and 4 mm. wide. Ulmer and Lestage recorded larvae up to 21 mm. long.

Head:

The head is hypognathous. The clypeal band is dark brown and is dilated transversely at its oral end. The dark brown bands on the genae converge to form a V and they may touch the aboral margins of the frontoclypeus. The genae bear dark brown spots on their anterior and posterior surfaces and along their sides. The posterior surfaces of the genae are chestnut brown except for the area surrounding the gular sclerite and the area above the labium, which are golden yellow. The gular sclerite is golden yellow and in most specimens bears a dark brown pattern and does not separate the genae completely. The genal suture may be closed or slightly open.

Labrum:

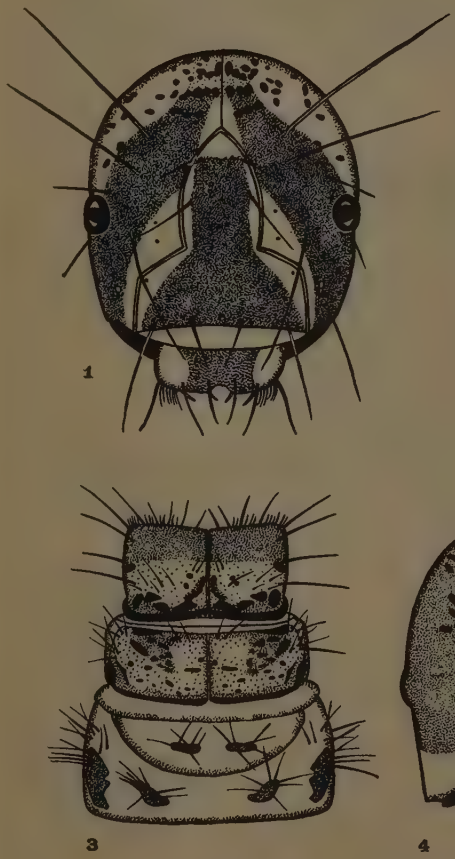
The ventral margin of the labrum is concave. On both sides of the concavity there are three long setae, two small setae and a group of marginal hairs.

Mandibles:

Both mandibles have four blunt teeth, a brush on the inner surfaces and two setae on their outer surfaces near the base.

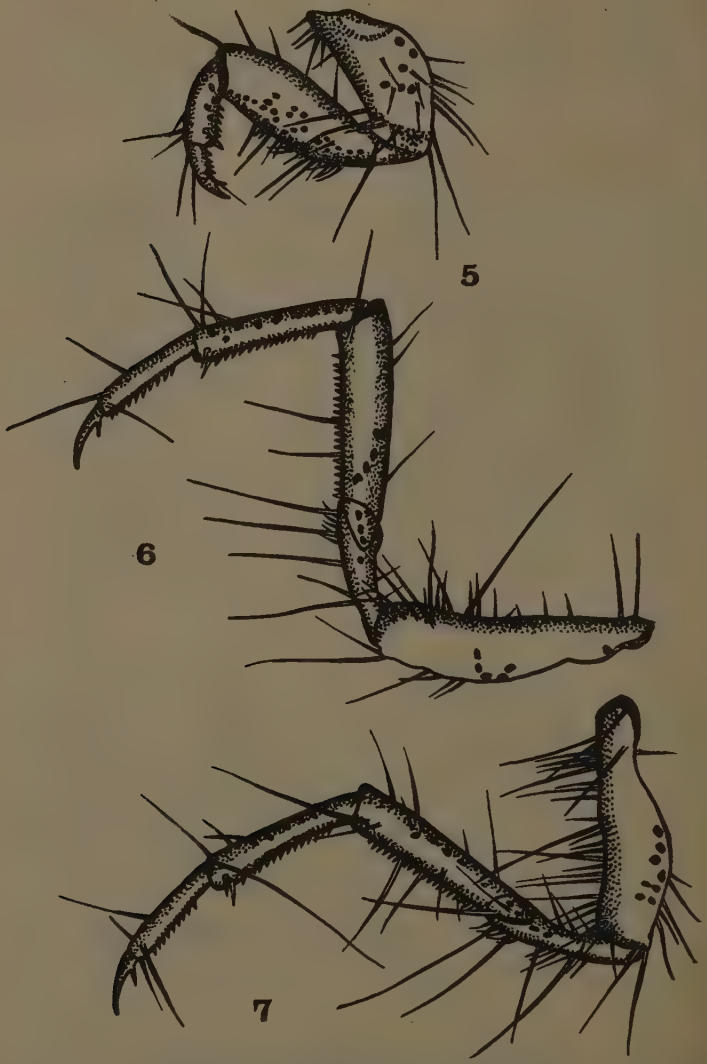
Maxilla:

Both the cardo and the stipes bear two setae. The maxillary palp has five segments, of which the terminal bears two sensillae and the basal a group of hairs and a seta.



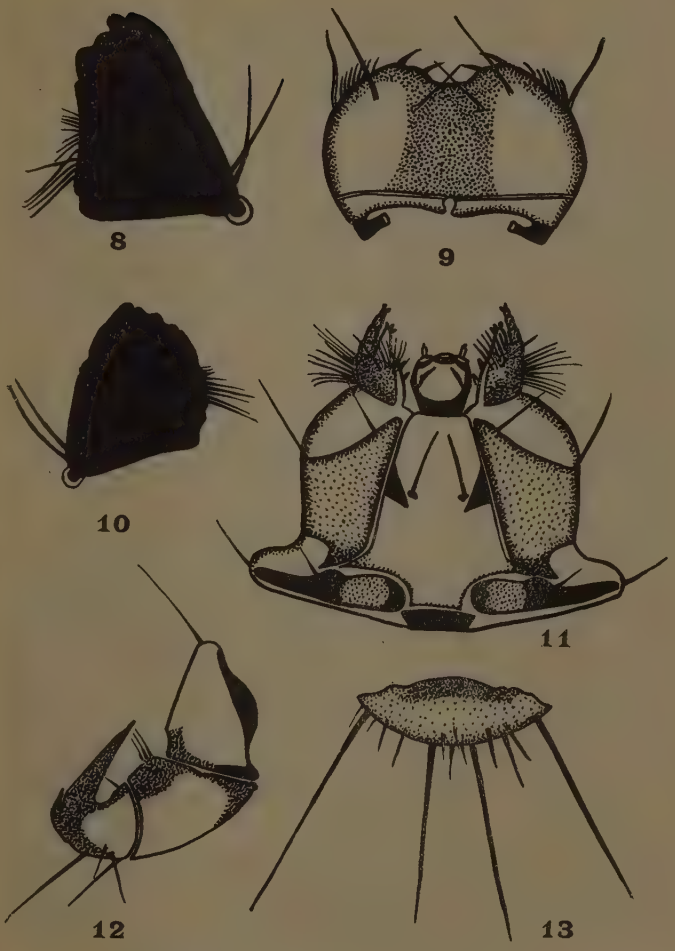
LIMNEPHILUS MARMORATUS CURTIS

Figs. 1-4. (1) Head from the front. (2) Larval case. (3) Thoracic nota from above. (4) Head from behind.



LIMNEPHILUS MARMORATUS CURTIS

Figs. 5-7. (5) Prothoracic leg. (6) Mesothoracic leg. (7) Metathoracic leg.



LIMNEPHILUS MARMORATUS CURTIS

Figs. 8-13. (8) Left mandible. (9) Labrum. (10) Right mandible. (11) Labium and maxillae. (12) Anal appendage and anal claw. (13) Anal sclerite from above.

Thorax:

The pronotum is entirely sclerotised and has a median longitudinal suture. The posterior and latero-posterior margins of the pronotum are heavily sclerotised and are entirely black. The anterior third of the pronotum is dark brown. Posteriorly the pronotum bears dark brown spots. The mesonotum is sclerotised except for its margins and has a median longitudinal suture. There is a dark brown pattern on both sides of the suture, which is subject to considerable variation. The posterior and latero-posterior margins of the mesonotum are heavily sclerotised. The metanotum is formed of two distinct parts and has six sclerites, each of which bears a number of setae. The prosternal horn is well developed and the prosternal sclerite is present. The mesosternum has a number of black spots divided into two groups.

Legs:

The prothoracic leg is short and robust. The mesothoracic leg is slightly longer than the metathoracic leg. All the legs bear a dark brown pattern. The inner surfaces of the femur, tibia and tarsus carry small spines on their inner margins and there are a few hairs on the second segment of the trochanter. The tibiae of all the legs carry two spurs.

Abdomen:

On the first abdominal segment there are three protuberances, of which the dorsal is devoid of setae, and there are some setae around its base. The two lateral protuberances possess a small number of small setae. The gill filaments are present on abdominal segments two to seven. The lateral line running from segments three to eight is formed of fine hairs. The anal sclerite, which is elliptical, has a dark brown pattern in most of the specimens. The anal appendages have two segments each and the anal claw has an auxiliary claw at its base.

The clypeal band is considerably dilated transversely at its oral end in the larvae of *L. marmoratus* Curt., *L. politus* McLach., *L. flavicornis* (F.), and *L. stigma* Curt., and for this reason may be easily confused. The presegmental gills on the eighth abdominal segment, however, are absent in the larvae of *L. marmoratus*, whereas they are present in the larvae of the other three species. In *L. politus* there is a deep notch of lighter colour at oral end of the clypeal band. Ulmer and Lestage pointed out that the head of *L. flavicornis* is much shorter and broader than the head of *L. stigma*.

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VARIATION IN THE NOVEMBER MOTH *OPORINIA DILUTATA* (SCHIFF.) (LEP.: GEOMETRIDAE)

By J. P. ROBSON

Plates viii and ix

In recent years I have taken special interest in the genus *Oporinia* Hübner, there being such a range of variation in the four British species, particularly in *O. dilutata*, the November Moth, the typical form of which is shown in pl. viii., Figs. 1 and 2.

I had read Professor J. W. Heslop Harrison's paper on the genus (1932, *Trans. North. Nat. Un.*, **1**:128), and set about searching for as many of the forms named therein as I could find locally in Upper Teesdale, mostly in the Barnard Castle area. Besides the following common forms: *inscriptata* Don., Fig 4—fasciae intensified; *tectata* Fuchs (*impluviata* Schiff. Borkh. *nec* Schiff.), Fig. 31—fasciae nearly obsolete; *pallida Prout*, Fig. 10—very light ground colour, with clearly marked fasciae; *obscurata* Stdgr., Fig. 7—dark ground colour, fasciae obscured; and *melana* Prout, Fig. 33—dark ground colour, fasciae obsolete; there were others in fewer numbers, such as *ventilata* Fabr., *precursaria* Gregs. and *coarctata* Prout, Figs. 36, 37, 38 and 39, and *latifasciata* Prout, Figs. 3, 5 and 6, with the third and fourth fasciae linked up to form a broad median band.

In October, 1948, I found a male of the *latifasciata* form, Fig. 3, on a fence post in Flatts Wood, Barnard Castle. It had very few markings on it, except a distinct band a little darker in shade than the slate-grey of the ground colour. On another fence post not far away I came across a freshly emerged female of the *inscriptata* form, Fig. 4. At night these insects paired and produced fertile ova. From the ensuing brood in 1949 I obtained about a hundred more or less typical, Figs. 1 and 2, or *inscriptata*, Fig. 4, specimens, and about twenty of the banded form *latifasciata*, Figs. 5 and 6. I paired a *latifasciata* male, Fig. 5, with an *obscurata* female, Fig. 7, and this pairing produced about fifty per cent more or less typical, Figs. 1 and 2, or *obscurata*, Fig. 7, forms; thirty-five per cent banded specimens, Figs. 8 and 9; and fifteen per cent of a suffused melanochroic form, Figs. 13, 14 and 15.

In 1953 I paired a banded male of the *inscriptata*, Fig. 4, stock with a female of the *pallida* form, Fig. 10. These produced light specimens with intensified bands, Figs. 11 and 12. Of the various banded forms the latter are certainly the most striking and attractive in appearance.

The melanochroic form, Figs. 13, 14 and 15, mentioned above, was something of a puzzle. Dr. E. A. Cockayne said it was a new form to him. Professor Heslop Harrison pronounced it a modified

form of *fimbriata* Haw., Fig. 22. Wild *fimbriata* is usually as in Fig. 22. Figs. 23 and 24 may be other modifications of *fimbriata.*

From subsequent breeding of the banded *obscurata* forms, specimens more like *fimbriata* have appeared, Figs. 16, 17 and 18. From pairings of the banded forms of the *pallida* stock, corresponding *fimbriata* forms have appeared, Figs. 19 and 20. These have much lighter coloration, and are very attractive insects in appearance. The latest variation I have obtained of this is the form shown in Fig. 21, which really corresponds with Fig. 18 in the darker stock.

Fig. 31 is *tectata* or *impluviata,* with fasciae nearly obsolete.

Fig. 32 is a wild specimen I found drying its wings on an elm trunk in 1949. It shows a variation I have not seen before or since.

Fig. 35 is an intermediate between *inscriptata,* Fig. 4, and *pallida,* Fig. 10.

Fig. 34 is a modification of *pallida,* Fig. 10.

Figs. 36, 37, 38 and 39 are probably forms of *coarctata,* with third and fourth fasciae very close together, but not making a solid band.

Fig. 25 resembles the typical form, but has very pale fringes on all the wings; these are clearly shown up by the shadows of the insects. Fig. 26 is a banded specimen out of the same brood.

Fig. 27 has an extremely wide band; and Figs. 28 and 29 have very narrow bands.

Fig. 30 is a dwarf aberration.

Early in 1953 I received from Professor Heslop Harrison a batch of ova laid by a female of the form *regressa* Harrison, Fig. 41—dark ground colour, markings practically obsolete, median area showing a broad silvery white band—which had paired with a male of a new light golden brown form which he had taken in the north of County Durham, and which he has since named *aurata,* Fig 42 (1954, *vasculum* (substitute) **39**:4:32). From these were bred about a dozen of each form, but mostly the specimens were like Fig. 40. I failed to obtain pairings of either *regressa* or *aurata,* or a pairing between them, but managed to pair *aurata* with *latifasciata,* Fig. 6. In 1954 only specimens similar to Fig. 40 emerged, but a pairing of these produced both *aurata* and *regressa* forms in 1955.

I am much indebted to Mr. Geo. E. Hyde, F.R.E.S., for the photographs reproduced in plates viii and ix.

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Figs. 1-21. Variation in *Oporinia dilutata* (Schiff.).
(Specimens shown three-quarters natural size.)

Figs. 22-42. Variation in *Oporinia dilutata* (Schiff.).
(Specimens shown three-quarters natural size.)

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SOME ASPECTS OF THE STUDY OF APHIDIDAE (Hem.)

By C. S. WOOD-BAKER, M.Sc., PH.D., F.Z.S., F.R.E.S.

The intention here is to survey briefly some aspects of the study of aphids. Inevitably other aspects will be omitted, for example the rôle of aphids as vectors of plant viruses, and the work which has been done on aerial distribution of aphids. The obvious importance of aphids as pests of cultivated crops as well as of ornamental and wild plants has long been realized. The historical development of the study of aphids has been dealt with by L. O. Howard (1930), and Hille Ris Lambers (1947 et seq.) has described the development of concepts of individual genera. To the general zoologist, aphids are of interest as affording examples of parthenogenesis. Fertilization is achieved here by a type of maturation in which meiosis is omitted (7).

HOST PLANTS AND HABITATS

Plant-lice show a remarkably wide range of host plants and habitats. The Lachninae are restricted to Coniferales, with the exception of the Tramini which have become adapted to a root-dwelling existence on various Compositae and other plants. This change in habitat may well have taken place by way of the habit of myrmecophily (this would perhaps be more correctly called 'aphidolatry' on the part of the ants!), since some Lachninae live on the bark at the bases of young trees, where the ants build earth-galleries to enclose them. An example is afforded by *Stomaphis longirostris* F., which feeds on *Salix* or *Populus,* living in the crevices in the bark of large trees, and is usually attended by *Lasius fuliginosus* Latr. Colonies are often found below ground-level, though they may equally occur up to twenty feet above.

Most of the Chaitophorinae and Thelaxinae (syn. Vacuninae) are limited to Fagaceae, Aceraceae, and related families of plants, the two groups of aphids having achieved this end by different routes during evolution. Many have become greatly reduced in size during the process.

The Aphidinae (e.g. Aphidini, Dactynotini, Macrosiphini, etc.) feed on the arborescent Rosaceae and Elaeagnaceae for the greater part, at least as winter (primary) hosts on which sexuales and eggs occur. Many species have spread in the course of evolution to members of nearly all the families of flowering plants, in some instances retaining the obligation to return to the primary host for the winter, whilst in the most advanced species this necessity is lost, and they pass the entire life cycle on herbaceous plants. In extreme cases (e.g. *Aulacorthum circumflexum* Buckt.) they may be able to exist indefinitely without any production of sexuales or winter eggs.

The habitats of aphids show very well the degree to which organisms can become adapted to very different micro-climates, and this is very noticeable when considering the factors of exposure to wind and atmospheric humidity. It might be supposed that very small insects such as aphids, with only a thin cuticle (although the latter is usually provided with a certain amount of wax secretion), would be subject to rapid desiccation in exposed situations. Nevertheless there are several species of *Macrosiphoniella* which live on *Artemisia* in Europe, and in the southern desert areas of North America there is a range of very peculiar, probably endemic genera such as *Epamaïbaphis* Oestl. and *Flabellomicrosiphum* Gill. & Palm., which feed on species of *Artemisia* and related genera of plants under desert conditions. Their ability to survive under such conditions may be ascribed to the fact that they remain permanently feeding, obtaining liquid directly from the xylem of the host, and therefore able to replace water as fast as it is lost.* In contrast to this state of affairs, some of the radicicolous Pemphigini and Fordinae are able to tolerate complete immersion in the water of streams near which the secondary host plants (e.g., *Apium, Mentha*) grow. The same is true in a lesser degree of the Phylloxerinae. This tolerance is due to the secretion by the aphids of greater or less amounts of flocculent wax (solid or hollow filaments) which hinder wetting of the insects. Such aphids seem to have a low metabolic rate, and grow very slowly as compared with Aphidinae. *Prociphilus oleae Koronèos,* on olive in Greece, is an example of an Eriosomatine bark-feeder which lives under dry conditions.†

Galls

Aphids have long been known as the cause of a great variety of true galls, pseudogalls or leaf-galls, and leaf-distortions. Leaf-curl or leaf-rolling of varying degree is caused by members of the Anuraphidini, and to a lesser extent the Myzini, often on members of the Rosaceae, which are of economic importance. True galls are caused by many Eriosomatinae on species of *Populus* and *Ulmus*. In some instances the fundatrix inhabits one type of leaf-gall, whilst the apterous fundatrigeniae inhabit a different type, though in others (*Colopha, Tetraneura, Pemphigus*) the fundatrix and all her offspring inhabit one gall, which is often sac-like or ovoid. Many of these galls are entirely closed until they ripen in July or August, and the

* Certain species of *Sipha* and *Atheroides* have the tergites with an armour-plating of separate rectangular sclerotic areas, or have the abdominal tergites entirely sclerotic and fused together. They inhabit xerophytes such as *Ammophila arenaria* and other stiff grasses, and must be adapted to avoid loss of water.

† Some Aphidinae habitually live in close proximity to a water surface (e.g., *Rhopalosiphon nymphaeae* L.). Such insects are provided with a reticulate marking of minute denticles on the cuticle, and this, together with the secretion of small amounts of wax-powder, serves to prevent drowning.

honeydew voided by the aphids forms small or large globules each enveloped by a thin coating of wax-powder, so that the aphids are able to move about readily. In some of these galls (*Pemphigus lichtensteini* Tullgr., *P. protospirae* Licht.) the honeydew nourishes a yeast-like fungus. In the *Fordinae* galls are formed on *Pistacia* and *Rhus*. These plants do not extend north of the Mediterranean region, so that over much of Europe and Asia these species of aphids occur only as the anholocyclic virgogenia-form, that is to say the true fundatrix and fundatrigenia are entirely wanting from the life cycle, and the virgogeniae and occasionally also sexuparae (which must then be incapable of contributing to the next generation) are the only forms represented.

The Phylloxerinae are important as containing the notorious grape-vine *Phylloxera* (P. *vastatrix* Planch., syn. *vitifolii* Shim., *vitisana* Westw.). This lives on the bark of the trunk in summer, and larvae produced during the summer migrate to the roots, on which they form galls. Winter generations then occur in these root-galls below ground. A somewhat similar vertical migration occurs in *Eriosoma lanigerum* Hausm. ('American blight' of apples), but here migration to *Ulmus* is to be expected as in other members of the genus; this has been claimed to take place by some American authors (Patch, 1912, in Hottes and Frison, 1931), whilst on the other hand observations in England have failed to reveal any such migration.

Galls of restricted distribution

One of the most curious of gall-makers is *Tamalia coweni* Baker, which occurs in purse-like pseudogalls on leaves of *Arctostaphylos* in the Great Lakes region only, thus exhibiting both a very specialized habitat and restricted distribution. The systematic position of the genus *Tamalia* seems to be uncertain; it may be placed near *Stegophylla* in the Phyllaphidina, or near *Mindarus* and *Phloeomyzus* in the *Thelaxinae*.

In the *Pemphigina* the aphids usually migrate from galls on *Populus* to the roots of grasses and other plants where the summer generations are passed. A number of Pemphigines have been described for the radicicolous form, without the return migration to *Populus* in the autumn having been observed. It remains to be proved whether some of these may link up with known gallicolous forms, or they may be anholocyclic forms of which the gallicolous stages have been lost, now perpetuating themselves by parthenogenesis only. Other groups also show a similar parallelism of holocyclic and anholocyclic forms, such as *Hamamelistes betulae* Mordw. and *H. betulinus* Horv. in the Hormaphidinae, *Geoica* and *Forda* in the Fordinae.

Geographical distribution

The geographical distribution of aphid species ranges from the restricted type mentioned for *Tamalia* to that exemplified by *Aphis*

(*Doralis*) *fabae* Scop. s. lat. and *Myzus persicae Sulz.*, which are now cosmopolitan. The potato aphid, *Macrosiphum* (*Macrosiphum*) *euphorbiae* Thos. is doubtfully distinct from *M.* (*M.*) *solanifolii* Ashm., and if distinct, then the former is to be taken as the New World form, whilst the latter occurs throughout the Old World. Probably many such species-pairs will be shown to exist, especially in the large complex of genera related to *Macrosiphum*, and in the *Aphis* complex. The work of Nevsky (1929) would suggest that there are some species with a distribution in N. Asia and Siberia. *Anuraphis ephedrae* Nevs. on *Ephedra alai*, *Neaphis viridis* Nevs. on *Artemisia annua*, *Xerobion eriosomatinum* Nevs. on *Kochia prostrata*, *Xerophilaphis tamaricophila* Nevs. and *Brevicorynella quadrimaculata* Nevs. on *Tamarix*, and *Acaudella puchovi* Nevs. on *Atraphaxis buxifolia*, are some examples which are probably restricted to this region. The genus *Xerophylla* is interesting as being restricted to southern North America, where it is confined to species of *Carya* on which the leaves bear small galls reminiscent of those caused by *Cynipid* gall-wasps on *Quercus*. A curious southern distribution is exhibited by *Sensoriaphis nothofagi* Cottier (1953), which is co-extensive with *Nothofagus*, occurring in New Zealand, part of Australia, and the Patagonian region.

The work of Roberti (1938, 1939) on certain Pemphigini is useful, taken with Lichtenstein's older work, in helping to understand this complex group. From personal observation it seems that *Pemphigus protospirae* Licht. and *P. spirothecae* Pass. may have been confused in the past. The latter has a distribution in Britain and Northern Europe, extending to the Mediterranean in smaller numbers, whilst the former is more frequent in Southern Europe, and possibly extends further eastward. The date of emergence of alatae from the galls, which has been suggested as one of the means of distinguishing the two species, may be misleading, since alatae of *spirothecae* emerge from late July until September, whilst those of *protospirae* leave from late June until the end of July. In Italy (Umbria, Tuscany, Emilia to Venezia Tridentina) galls of *spirothecae* on high ground ripen about a month later than those on low ground.

A number of curious species live on mosses. Theobald erected *Truncaphis* and described T. *newsteadii* Theob. from moss in Britain, placing it near *Gobaishia* in the Eriosomatini, but it should come near *Melaphis* in the Fordini, since *M. rhois* Walsh in N. America has its summer forms on mosses, usually on the rhizoids or lower parts. *Rectinasus* sp. has also been found (Wood-Baker 1952) in association with mosses on bark of *Salix*, and unattended by ants. This seems to be in contradiction to other records of *Rectinasus* as inhabitants of ants' nests. Perhaps in Britain members of this genus are unable to survive except when protected, whereas in S. Europe they can live in summer without the assistance of ants. The sexuales and primary host for *Rectinasus* are unknown, indeed may have been

entirely lost in the course of evolution. Börner (1933, 1952) describes a genus *Muscaphis* in the Myzina, from mosses (e.g., *Polytrichum commune*). The paucity of material here, and the absence of alate forms, indicates that *Muscaphis* should be regarded with caution, but it may possibly contain species which are restricted to Alpine regions.

Classification—New characters

The classification of aphids presents many difficulties owing to the small size of most species and the fact that properly cleared microscopical mounts must always be made. A century ago in Britain, Francis Walker described many species, and named them frequently after their food-plants. Within relatively few years of this several Continental workers (e.g., Koch, Passerini) produced extensive works describing species known to them. In the first two decades of the present century attention was focused on aphids more from the economic viewpoint, and the more critical works of Theobald, Van der Goot and others appeared. These, however, still largely made use of the classical characters for systematic determination; for example, the size of the frontal tubercles, the shape of the frontal simus between them, the length of the whole antennae and of the siphons relative to the body, were taken as being of major importance. The total number of characters taken into consideration together was still insufficient either to give a natural classification, or to avoid confusion of many species which are now known to fall in different tribes. The work of Mordwilko became known only after the twenties, and has led to a better understanding of morphological characterization, as well as the theory of aphid life cycles. During the past thirty years and more Carl Börner developed and extended his views on systematics, and employed, in addition to more conventional characters, those which relate to the chaetotaxy of neonate young forms. Hille Ris Lambers utilizes chaetotaxy in a slightly different way, since he relies to a greater extent on the condition in adult forms, and further takes into account the type and extent of sclerotic pattern, particularly on the abdominal tergites. The latter author has (Hille Ris Lambers 1938) drawn attention to the importance of the characters of the rostrum, especially of its terminal portion ('ultimate segment' or article). Recent workers have realized increasingly the value of the minute characters of the surface of the cuticle, both on the general body-surface and in specialized areas.

Since the concept of a species has progressed from that of a series of observations and measurements on single individuals to that of a mean for an entire population (in an ideal case), it has become increasingly obvious that in order to clarify the status of many species, aphids should be bred for several generations, or even for several years, so that food plant preferences could be taken into account. The species-complex, including *Aphis* (*Doralis*) *fabae* Scop.

sens. lat. (*rumicis* of older authors) affords an example. In this the work of Franssen and others has indicated that there are species which differ markedly in their habits and behaviour though indistinguishable on morphological grounds alone.

The length of hairs on the body has been used as a character for separating some species pairs in *Aphis s. lat.* and *Brachycaudus* in which genera pairs of species, morphologically very close, inhabit the same food plant, and are distinguished by being short- or long-haired. The minute structure of hairs can also be used as an aid in determination, including such features as the nature of the hair-insertion (whether on a small sclerite or not, raised on a small papilla or not so), the shaft (whether strongly sclerotic or not), and the apex, which may be attenuated or blunt, or otherwise expanded into a slight vesicle, an ovoid larger vesicle, or a large spherical vesicle, with or without some degree of sclerotization. The very peculiar hairs of *Cryptaphis satiger* H.R.L. (1947) first led to its recognition as representing a new genus. In *Geoica* (Fordini), *Flabellomicrosiphum* (Aphidini), and *Iziphya* (Chaitophorini) there are short hairs with flattened and curved fan-shaped, fimbriate or spatulate apices.

Measurements and Taxonomy

Richards (*in* De Beer 1938) has stressed the need for more of a quantitative basis for taxonomic descriptions. Gillette and Palmer (1931-1934) and Palmer (1952) in their synopses of species give the usual measurements for body-length, length of siphons, cauda, antennal segments, and so forth, with in each case a mean value, or an indication of the extreme values. This is of course useful, but for the greatest usefulness might include values for the mean, the mode, and the total number of measurements on which the results are based. The sample should consist of at least 50 to 100 specimens before any extreme values for the whole population become included. Values for one individual are useless if given as though typical for a species. Samples of *Pemphigus lichtensteini* Tullgr. taken from many galls of different sizes, on different regions of twigs of numerous *Populus* trees in one locality, for example, showed large (normal) individuals having dimensions twice or more those of dwarf individuals of the same species. To a lesser degree the same kind of difference is found between normal and dwarf alatae of *Aulacorthum solani* Kalt. (*pseudosolani* Theob.). Such ranges of variation will not help in distinguishing two 'adjacent' species which are alike in morphological characters, unless it is possible to show that there are significant differences in mean and modal values. As was pointed out above, there are groups of species in which morphological differences cannot be detected, and it is in just such cases that tabulated and analysed results on large samples will help.

To turn to the question of the value of measurements of antennal

segments; early workers gave a series of ratios for the segments, indicating also the total length: more recently both the ratios (segment III : IV : V : VI base plus unguis) and separate measurements have been given, but often only for a single specimen. Now, in most aphid species, segment III exceeds IV noticeably; but in a few cases e.g., *Doralis ruborum* Börner)* III very nearly equals IV, or rarely is shorter. Occasionally it is found that whereas the majority of specimens have III equal to IV, a few have it either shorter or longer, whilst in a few cases IV is normally considerably longer than III. In these cases of variable species, it seems that any ratio or set of values based on few individuals will give a false picture, and even when a large sample is used it will be difficult to 'fit' new material. In order to illustrate the points mentioned above, some figures are given (Table I) for a random selection of species for which the writer has been able to compare published results with those obtained from his own material. This table emphasizes two interesting points; firstly, the wide range of variation which occurs in the length of segments, and secondly, the considerable range in values for the III : IV ratio within a species. A further but unrelated point of interest is the existence of several species of *Macrosiphoniella* in which this ratio is near unity. Stroyan (1955) has indicated that this is an uncommon value. Here it may be urged that the use of segment III as a standard to which the other segments are related should be abandoned in favour of a series of ratios in which they are related to VI-base as a less variable member. Stroyan has in fact utilized the ratio of VI-base to the total antennal flagellum (i.e., segments III-VI).

Consideration of the ratios of length of antennal segments leads to the question of the rate and manner of growth of these appendages. Observations on long series of individuals in all instars, as well as tables of measurement for adults, at once make it clear that the terminal segment is the first to achieve its definitive stature, and segment III the last to do so. Segments I and II here correspond to the antennal 'scape' in other orders, and the remaining segments to the 'flagellum'. Now it has been shown in the Heteroptera that a region just distad of the 'scape' is the region in which growth in length takes place most rapidly. For this region the term 'meriston' has been coined. Perhaps an analogy may be drawn between this phenomenon and the intercalary growth of new metameres in some *Annulates*. Bearing in mind that in aphids segment III completes its growth only in the penultimate instar, and that the food supply of these insects is subject to considerable fluctuations, it is then not surprising that the absolute length of segment III, and to a lesser extent of segments IV and V, shows considerable variation.

* Here the two segments are occasionally equal, though usually III is about 1.1-1.3 times IV, rarely III is slightly the shorter (in alatae). Apterae have III 1.2 times IV.

Cryptic species

A large number of the known species of aphids are cryptic, in that they are normally concealed in a variety of ways. The type of leaf-curl caused by *Brachycaudus helichrysi* Kalt. on plums, *Myzus cerasi* F. on cherry, and *Aphis* (*Doralis*) *spiraecola* Patch on *Spiraea*; the leaf-pseudogalls caused by *Cryptosiphum gallarum* Kalt. on *Artemisia,* by *Thecabius affinis* Kalt. on *Populus,* and by *Eriosoma ulmi* L. on *Ulmus*: together with the true galls caused by *Pemphigus* spp. on *Populus* and by species of *Eriosoma, Gobaishia,* and *Tetraneura* on *Ulmus,* all provide examples of concealment and protection. Some of these have been alluded to earlier. The bright red leaf-galls on *Crataegus* caused by *Yezabura crataegi* Kalt. are often found to be perforated; this probably is done by insectivorous birds, and at once opens the way for Coccinellid and Syrphid predators which might otherwise fail to become established so early in the life of the aphid-colony. Thus protection by plant tissue may become disadvantageous if the feeding of the aphids induces bright colours in them.

Many species are themselves cryptically coloured. *Monaphis antennata* Kalt. on *Betula* feeding on the young twigs appears exactly like the young leaf-buds. Many species of *Neochmosis* resemble very closely the bark of pines and spruces on which they feed.

The appellation 'cryptic' has recently been used for species which live a very retiring life in situations such as the bases of grasses near the soil, in the bases of hedgerows, concealed under fallen branches, and even in chambers underground. These have in some instances been long overlooked by collectors, or have been supposed to be very rare. *Myzus* (*Jacksonia*) *papillata* Theob. and *Cryptaphis setiger* H.R.L. are examples of species which prove to be widespread, forming moderately large colonies, though easily overlooked. The former has been found (Wood-Baker 1950) in many localities in Cork and Kerry, and in England in places as widely spaced as Sussex, Yorkshire and Anglesey.

Rhopalosiphoninus latysiphon Davids. has of recent years assumed considerable importance as a pest of potato tubers, particularly during storage. This species normally occurs in small numbers below ground in the field.

Of the truly subterranean aphids, most belong to groups such as the Eriosomatinae in which much flocculent wax is secreted, so that the aphids are protected against undue wetting. However some members of the genera *Anuraphis* s. str., *Yezabura,* and *Aphis* s. str. live hypogeally at least for part of the life cycle; most of them secrete a small amount of wax-powder, but some *Anuraphis* appear to be able to survive on small rootlets (where soil spaces cannot be large) without any such protection.

Size and specialization

It may be worth while to draw attention to the question of size

in aphids. It appears that evolutionary success has been achieved by those species which have become reduced in size. The most primitive group, the Lachninae, contains species with a body length (vertex to cauda) of 3-6 mm. Within the Aphidinae the Macrosiphina have retained comparatively large size (2-4 mm.) together with frequently conspicuous coloration (e.g. in the genera *Dactynotus* and *Uromelan*; *D. tanaceticola Kalt.* is blood-red and feeds exposed on the upper surface of leaves), whilst the Aphidina (particularly the very large genus *Aphis*) have become smaller (1-1.8 mm. normally). The Macrosiphina have well developed secretory cells in connection with the siphons, and are able to squirt a yellow oily fluid in the

TABLE I

Measurements in mm./100

Species	Source	Form	Length ant. seg. III		Length ant. seg. IV		Ratio III/IV based on	
			max.	min.	max.	min.	max.	min.
Doralis symphyti (*gossypii*)	Nevsky	apt.	30	21	21	16	1·43	1·31
	Gillette & Palmer 1932	apt. dwarf	24	17	18	10	1·33	1·70
		apt.	17	12	10	8	1·70	1·50
	Wood-Baker 1952	apt.	30	29	21	17	1·03	1·70
		al.v.	29	25	22	19	1·32	1·31
	Nevsky	al.v.	27	24	19	17	1·42	1·41
	Gill. & P.	al.v.	35	20	23	10	1·52	1·50
Macrosiphoniella sanborni	Palmer 1952	apt.	60	50	35	23	1·71	2·17
	G. & P. 1932	apt.	60	50	35	23	1·71	2·17
	H.R.L. 1938	apt.	68	—	45	—	1·51	—
	Wood-Baker 1952	apt.	60	52	40	31	1·50	1·68
		al.v.	71	62	47	39	1·51	1·59
Macrosiphoniella oblonga Mordw.	H.R.L. 1938	apt.	103	—	102	—	1·01	—
	Wood-Baker 1952	apt.	101	98	105	99	0·96	0·99
		apt.	96	94	99	98	0·97	0·94
		al.v.	101	92	107	95	0·94	0·97
Macrosiphoniella sp. 3 (near *artemisiae* Fonsc.)	Wood-Baker 1952	apt.	83	77	75	68	1·11	1·13
Macrosiphoniella sp. 7	Wood-Baker 1952	apt.	85	63	71	58	1·19	1·47

Apterous viviparous females (apt.) and alate viviparous females (al.v.).

TABLE II

Measurements in mm./100

Species	Source	Form	Length ant. seg. III		Length ant. seg. IV		Ratio III/IV based on	
			max.	min.	max.	min.	max.	min.
Macrosiphoniella abrotani Wlk.	H.R.L. 1938	apt.	63	—	57	—	1·10	—
M. pseudolineata H.R.L.	H.R.L. 1938	apt.	—	—	—	—	1·26	—
		al.v.	—	—	—	—	1·09	—
		ovi.	—	—	—	—	1·00	—
M. absinthii L.	H.R.L. 1938	apt.	76	—	57	—	1·33	—
M. artemisi-vulgaris Knowl. & Allen	Palmer 1952	apt.	75	70	72	65	1·04	1·08
M. frigidicola Gill. & Palm.	Palmer 1952	apt.	58	42	54	38	1·07	1·10
M. zoothermum Kn. & Allen	Palmer 1952	apt.	58	43	40	25	1·45	1·72
Dactynotus ambrosiae Thos.	Palmer 1952	apt.	100	80	88	67	1·14	1·19
Macrosiphum corallorhizae Ckll.	Palmer 1952	apt.	120	105	100	90	1·20	1·17
Macrosiphum erigeronensis Thos.	Palmer 1952	apt.	88	62	56	44	1·57	1·41
M. rosae L.	Palmer 1952	apt.	105	90	78	68	1·35	1·32

Apterous viviparous females (apt.), alate viviparous females (al.v.), oviparous females (ovi.) of some N. American species. Compare with ratios given in Note 4 for European species.

faces of their foes, thus achieving some reduction in the attacks of Braconids and of predators. This mode of defence is only weakly developed in the Aphidina, which consequently are as a rule more heavily parasitized. A contributory factor may be the occurrence of myrmecophily in most of the latter, but very few of the former group, since the activities of ants would attract the attention of parasites.

Some Aphidina measure only 0.5-0.9 mm. in length (*Aphis* sp. on *Teucrium* in Co. Kerry, *Aphis* sp. on *Kochia* in Italy). The genera *Xerophylla* Walsh and *Cryptosiphum* are represented by very small species, highly modified for their very specialized mode of life. Many of the Eriosomatinae also are very small. Records (Wood-Baker 1951-1953) show that many species (e.g., *Pemphigus bursarius* Kalt., *P. lichtensteini* Tullgr., *Aulacorthum solani* Kalt.) produce, in addition to individuals of normal size, smaller numbers of individuals (dwarfs) having half the body length or less. These dwarf forms exhibit a corresponding reduction in the length of antennal segments and other appendages; the numbers of rhinaria on the antennae are not necessarily reduced, but often conform to the lower numbers which are usually found in the normal form. The significance of these dwarf forms is not at all clear. They often occur in company with large colonies of the normal form, and hence would not seem to be 'starvation' forms. They occur during early summer as well as later, so do not seem to represent abnormal forms preceding the production of males. In *Myzus* (*Tubaphis*) *ranunculinus* Walk. experiments have shown that dwarf alate females occur, some of which will breed satisfactorily when transferred to an appropriate food plant, whilst others, though they feed successfully, do not reproduce.

The Adelgidae (*Adelges* Vallot, syn. *Chermes* Curtis; *Pineus* C. B. and other genera) form a group of very small insects inhabiting Conifers, and frequently galligenous. They are frequently below 0.5 mm. in length. They show great specialization both in structure and life history, the latter being holocyclic with obligatory migration between two host plants, or anholocyclic with the sexuales omitted. All females are oviparous; this in comparison with the Aphididae may be regarded as the retention of an ancestral character, parthenogenesis being a secondary condition.

Several species are well known as serious pests of Coniferous forests. *Gilletteella* (syn. *Chermes*) *cooleyi* Gill. on *Pseudotsuga* is originally N. American, and now known in Europe. *Sacchiphantes abietis* L. attacks *Picea* spp. in Europe, and has spread to N. America. *Adelges laricis* Vall. (syn. *Cnaphalodes strobilobius* Kalt. partim.) forms conspicuous galls on *Picea* spp., with the virgogeniae on *Larix* spp., and is distributed wherever these trees are cultivated. *Pineus pini* L. is a common pest on *Pinus sylvestris* and spp.

To summarize then, the most serious aphid pests are to be found amongst species of very small size. These are capable of reproducing very rapidly, so that under suitable conditions they may form masses almost entirely covering the host plant. The larger species do not usually achieve such a density on the host plant. The *Lachninae,* which include the largest aphids of all, are minor pests, colonies usually remaining small. As with all generalizations there are exceptions: *Cinara* (*Tuberolachnus*) *saligna* Gmel. sometimes

forms very dense colonies on branches and trunks of *Salix* spp., as does *C. roboris* L. on *Quercus* spp., but many more small colonies are to be found than large ones.

Some III/IV ratios for common species.

Chaitophorus sp. 2.0	Dactynotus spp. ... 1.8, 1.4, 1.4
Hyperomyzus sp. 1.6	Macrosiphoniella sp. 1.2
Sitobion sp. 1.3	Doralis spp. 1.6, 1.75

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77 Greenway,
Chislehurst, Kent.
16th November, 1955.

CELERIO GALII (ROTT.) IN SUSSEX
(LEP: SPHINGIDAE)

On the night of 12th/13th June, 1956, one fresh male *C. galii* came to my mercury vapour trap. As the moth is in such a fine condition it may be possible that it is an offspring of last year's migrants.

W. J. HIGGINS.

Standard Nursery,
Old Worthing Road,
East Preston, Sussex.

SOME NOTES ON THE ECOLOGY OF THE AQUATIC AND SEMI-AQUATIC HEMIPTERA-HETEROPTERA AND THEIR ASSOCIATED FAUNA AND FLORA IN SOUTHERN HERTFORDSHIRE AND NORTH-EASTERN MIDDLESEX

By I. LANSBURY

(*Continued from page 166.*)

SECTION IV

Discussion of habitats: **1**. This pond was visited ten times and received the most attention; twenty-one species of water-bugs were recorded. The Corixids in this habitat had a very clear-cut distribution. Breeding species were: *Corixa punctata, Sigara limitata, S. nigrolineata, S. scotti, S. distincta, S. dorsalis, S. fossarum* and *Hesperocorixa moesta.* The remainder of the recorded Corixids were casual immigrants. Their distribution in the pond is delineated in histogram 3. Two species, *S. limitata* and *S. scotti* were the most widely distributed, *Hesperocorixa moesta* had the most restricted locus. In Locus (*E.*) *S. fossarum* and *S. distincta* were fairly common. *S. dorsalis* was associated with *S. distincta* in Locus (*F.*). *S. distincta* appeared to be more common in Locus (*F.*) than (*E.*). *S. dorsalis* and *S. distincta* is a typical association in acid habitats. In **10**. *S. falleni* replaced *S. distincta* in association with *S. dorsalis* (alkaline habitat). The presence of *S. nigrolineata* was rather curious, as in the south of Britain it usually frequents alkaline habitats, of which there was no shortage about Barnet. However, this is the only pond where it appeared to be breeding and it was very scarce elsewhere. Brown (1948) reported that it thrives in mountainous acid peaty pools; Macan (1939) reported that it was common usually in closed, alkaline and temporary habitats; in the lake district it is confined to lake reed beds at 1,500 feet in association with *Callicorixa wollastoni.* Why it should choose such conditions as were found in **1**. is very difficult to say. Locus (*A.*) to which *S. nigrolineata* was confined was without any vegetation; its associated species *S. limitata* and *S. scotti* are both rare in the south-east of Britain. A study of the populations present in Locus (*A.*) of the three common species, *S. limitata, S. scotti* and *S. nigrolineata,* gave some indication of relative breeding times and maturing periods. Unfortunately, *S. scotti* seemed to be a very unstable species and its absence from the January and February collections complicated the situation considerably. *S. limitata,* as histogram 1 indicates, reached a peak in March, then there was a pronounced falling off in April and May. The new population was at its peak in August, with many teneral specimens present. Further sampling showed a gradual decline in numbers for the remainder of the year. *S. nigrolineata,* histogram 2, shows the spring peak occurred in April and the new population did not appear to

reach its secondary peak until November; this may have been due to a percentage of the 1952 population living on into the autumn of 1953. The spring peak of *S. scotti* occurred in May; collections in March and April had an almost equal number of males and females. It is possible that if a collection had been made in June the real peak would have been found. The May collection indicated an upward trend in both sexes, although there were twice as many females as males. The new population reached its peak in September, then fell off in a series of short drops continuously until December. It is possible from this data to give a rough indication of the cycle of these three species in Locus *A.* during a twelve month period.

	A.	S.	O.	N.	D.	J.	F.	M.	A.	M.*
S. limitata	——						——			
S. scotti		——							——	
S. nigrolineata			——						——	

* Months of the year, commencing with August.

It is obvious that this is very vague, and to prove or disprove the suggested sequence of species it will be necessary to work out the the life-histories of the Corixids involved. Sutton (1947) worked out the life-history of *Corixa panzeri*, and from table 1 (p. 52) it appears that this species takes between 47-63 days from egg to adult. Whether the same length of time would be required for the species under discussion is a matter of some conjecture.

The distribution of *Notonecta* was well defined in this pond (see histogram 4). *N. obliqua* was the dominant species, *N. viridis* was sub-dominant, *N. glauca* was definitely scarce, but was breeding. It is rather unusual to find three species breeding in the same habitat. The greatest concentration of *Notonecta* was found about Locus (*E.*) and in the area adjacent to Locus (*D.*). This locus was rather interesting, as the great majority of the Heteroptera were predacious in this micro-habitat, i.e., *Nepa cinerea, Notonecta viridis, N. obliqua* and *N. glauca*; other predacious insects found in this locus were *Dytiscus marginalis*, both adults and larvae, *Polycentropus flavomaculatus* and *Libellula depressa.* The predominance of predacious species may be the reason for the lack of Corixids in this locus. Surface water-bugs were very scarce. Whether this can be correlated with the acidity and surface tension Walton (1943), or the fact that the pond was open with little protection from the wind, is difficult to say. This habitat is rather unusual for the anomalies discovered; *S. scotti* is completely isolated from its normal range by at least a hundred miles according to our knowledge of the distribution of the Corixidae in the home counties at the present time. To find both *S. scotti* and *S. fossarum* breeding in the same habitat is also a most unusual occurrence. Differences concerning the distribution of these two species has already been indicated in Section III. Finding *S. limitata* in an acid habitat is also somewhat irregular. Macan (1939) writes 'fairly common in the south and west, alkaline habitats'.

2. This habitat was visited eleven times; sixteen species of water-bugs were collected. Owing to a very large population of *Gasterosteus aculeatus*, Corixids were very scarce. It is doubtful as to whether any species bred other than perhaps *S. dorsalis*. Breeding water-bugs were mainly predacious, i.e., *Nepa cinerea, Ranatra linearis, Ilyocoris cimicoides*. The dominant Cryptocerate Hemipteron was *Ilyocoris cimicoides*, and the dominant Gymnocerate was *Mesovelia furcata*. In previous years *Ranatra linearis* was common in this pond; during 1953 only one was found. The distribution of the indigenous water-bugs is illustrated in histogram 5. A few years ago fish were abundant in this pond, particularly *Cyprinus carpio* and *Gobius gobius*; on one occasion a male *Rhodeus amarus* was collected, but this was obviously an introduction. Both *Cyprinus carpio* and *Gobius gobius* were exceedingly scarce in 1953, most of those seen had been attacked by a fungus disease. The general picture presented by **2**. is of a habitat declining rapidly through neglect and silting up, the vegetation choking the pond, particularly the submerged and floating species. Certain insects, i.e., Ephemeroptera and *Haliplus* were very common amongst the submerged vegetation; very few Odonata nymphs were ever found other than an occasional *Anax imperator*.

3. and **8**. These two habitats should be considered together because they are what can be best described as mono-specific Corixid habitats. They were each visited about eight times. The fauna in both cases consisted of one breeding species of Corixid and several predacious insects, not necessarily Heteroptera; in addition there were the usual casual immigrants. Vegetation was very limited or non-existent (see description of habitats in Section II). Some interesting facts emerge when the Corixids of these two habitats are considered together. An important factor is their geographical position in relationship to other habitats. **3**. is part of a pattern of ponds scattered about Hadley Green and Common (see diagram). This pond was not sheltered or overhung with trees like **8**., which was surrounded by willows. The fauna of the ponds on Hadley Green compared with those in Dyrham Park was much more varied. It is obvious that the *S. scotti* were from **1**. and almost certainly the *S. limitata* and *S. distincta* as well. Large breeding populations of *H. linnei* and *H. sahlbergi* were found in **6**. in Dyrham Park. It is possible to assume that perhaps a percentage of individuals of a new population in the late summer would migrate and disperse to other habitats. This migration could no doubt be made either in a series of short hops, i.e., from pond to pond on Hadley Green, or in fairly long flights such as from Dyrham Park to Hadley Green, a distance of one and a half miles in direct level flight. As previously indicated, **8**. was enclosed by trees and is thus probably not visible to any extent from the air during the late summer and autumn due to the foliage from the overhanging willows.

Habitat No.	Indigenous sp.	Casual immigrants.	Vegetation.	Chemical data.
3.	*S. dorsalis.*	*C. punctata, S. falleni, S. distincta, S. scotti, S. lateralis, S. limitata, H. linnei, H. sahlbergi.*	*Elodea canadensis.*	pH = 7.
8.	*H. sahlbergi.*	*C. punctata, S. nigrolineata.*	*Juncus effusus.*	pH = 4.5-6.

Table illustrating the differences between **3** and **8**. Two mono-specific habitats, with a list of the casual immigrants, vegetation and pH reaction.

The nearby ponds did not have a very varied Corixid fauna and this may account for the few casual immigrants recorded from **8**. (see table). When considering **3**. and its close proximity to habitats with a very varied Corixid fauna and the unobstructed view obtainable of this habitat from the air it will be seen that the number of casual immigrants was far greater than for **8**. Such factors as the pH value, vegetation and other Corixids in a habitat which will compete with it for living space can have no effect on a Corixid in flight according to our present knowledge of this family. The important factor would appear to be whether the habitat is visible; this is bound up with a habitat's actual position on a landscape; whether it is situated on the top of a hill, in a valley, the height of the banks, of the surrounding vegetation, and the ability of the Corixid to see reflected light on water surfaces. An interesting problem concerning Corixids migrating into a habitat totally unsuited for the species or colonization, is for how long they will stay in such a habitat.

4. Visited on eight occasions, twenty-two species of water-bugs were recorded, of which the great majority were casual immigrants. The indigenous population appeared to be *Corixa punctata, C. dentipes, Sigara dorsalis, Plea leachi, Microvelia reticulata, Nepa cinerea* and *Ilyocoris cimicoides*, other possible breeding species were *Sigara falleni* and *S. fossarum*. This pond was often very difficult to collect from owing to its shallow muddy bottom. The large number of species recorded is I think indicative of a pond on a possible Corixid migration route. Being situated on the crest of a slope above Hadley Woods and open to view all around it could easily be spotted. It is difficult to assign dominance to any particular species of Corixid,

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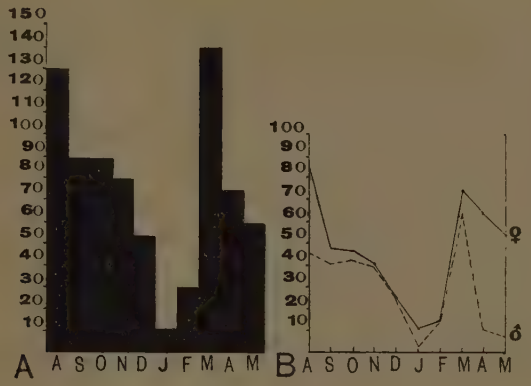
EXPLANATION OF HISTOGRAMS 1-2

Sigara limitata (Fieber) 1 (A). Total population in habitat No **1** (1953). (B). Sex-ratios in habitat No. **1** (1953). (C). Total population in habitat No. **10** (1953). (D). Sex-ratios in habitat No. **10** (1953). *Abscissa:* A-B. Months of the year commencing with August. C-D. Months of the year commencing with September (January omitted). *Sigara nigrolineata* Fieber. 2. (A). Total population in habitat No. **1** (1953). (B). Sex-ratios in habitat No. **1** (1953).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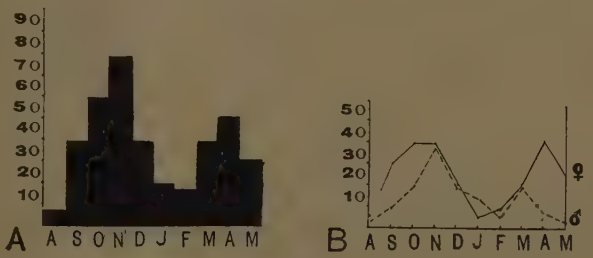
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2

but almost certainly further investigation would have proved that *C. punctata* was dominant. The finding of *C. dentipes* was most interesting, and it does seem possible that if habitats were examined where *C. punctata* was the dominant Corixid, possibly a small *C. dentipes* population would also be found. This species is almost certainly more common than the records indicate. The list of indigenous water-bugs indicates very clearly what type of habitat **4.** was. The great majority of species are typical of habitats where much detritus and rubbish are found. The casual immigrant Corixids were mainly found in the deeper water in the centre, as *S. dorsalis*, *C. punctata* and *C. dentipes* appeared to be scattered about the pond generally. *Ilyocoris cimicoidas* was commonest under dead leaves lining the bottom on the southern side; these leaves were from an oak tree some distance away.

5. This habitat was visited eight times and sixteen species of water-bugs were recorded. Breeding species were *Micronecta scholtzi*, *Hesperocorixa sahlbergi*, *Gerris lacustris*, *G. odontogaster?*, *Microvelia reticulata*, *Hydrometra stagnorum*, *Notonecta glauca* and *Nepa cinerea*. This habitat differed from all the others worked because of the great amount of emergent and floating vegetation present, consequently surface Hemiptera were more abundant, i.e., Gerrids, than elsewhere. As the part of the habitat worked was joined to a larger body of water by a channel, certain species listed in the Hemiptera recorded in Sections I and II, particularly *S. dorsalis* and *S. falleni*, were almost certainly resident in the main body of the lake, although they were not breeding in the part of **5.** examined. Mr. P. N. Lawrence found *Micronecta scholtzi* in association with *S. dorsalis* and *S. falleni* in the main part of **5.** during April, 1954.

6. This pond was collected from on nine occasions and fifteen species of water-bugs were found. Indigenous species were *Hesperocorixa linnei*, *H. sahlbergi*, *Sigara fossarum*, *Corixa punctata*, *Notonecta glauca*, *Microvelia reticulata*, *Gerris odontogaster* and *Ilyocoris cimicoides*. The distribution of certain indigenous water-bugs is shown in histogram 6. The remainder of the Hemiptera recorded were casual immigrants. The large population of *H. linnei* present in January, 1953, is very puzzling. It is very doubtful as to whether this is the spring peak. On the day when this swarm was observed it was very

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EXPLANATION OF HISTOGRAMS 3-7

3. Histogram illustrating the distribution of the indigenous Corixidae in habitat No. **1**. 4. Histogram showing the distribution of Notonecta in three loci of habitat No. **1**. 5. Histogram illustrating the distribution of resident Heteroptera in habitat No. **2.** 6. Histogram showing the distribution of the commoner Heteroptera of habitat No. **6.** 7. Histogram illustrating the distribution of the commoner Heteroptera in habitat No. **10.**

SPECIES / CONDITIONS	SIGARA LIMITATA	SIGARA NIGROLINEATA	SIGARA SCOTTI	SIGARA DISTINCTA	SIGARA DORSALIS	SIGARA FOSSARUM	CORIXA PUNCTATA	HESPEROCORIXA MOESTA
LOCUS A								
LOCUS B								
LOCUS C								
LOCUS D								
LOCUS E								
LOCUS F								
CLUMPS OF GLYCERIA								

3

4

SPECIES / CONDITIONS	NOTONECTA OBLIQUA	NOTONECTA GLAUCA	NOTONECTA VIRIDIS
LOCUS B			
LOCUS C			
LOCUS D			

5

CONDITIONS / SPECIES	GERRIS LACUSTRIS	GERRIS ODONTOGASTER	RANATRA LINEARIS	MESOVELIA FURCATA	NOTONECTA GLAUCA	NEPA CINEREA	ILYOCORIS CIMICOIDES
GLYCERIA CLUMPS							
POTAMOGETON NATANS							
UNDER BANKS OF POND							

6

SPECIES / CONDITIONS	HESPEROCORIXA LINNEI	HESPEROCORIXA SAHLBERGI	CORIXA PUNCTATA	SIGARA FOSSARUM	NOTONECTA GLAUCA
OPEN WATER NO VEGETATION					
SHALLOW WATER DEAD LEAVES ON BOTTOM					
AMONGST POTAMOGETON NATANS					

7

SPECIES / CONDITIONS	SIGARA LIMITATA	SIGARA LATERALIS	SIGARA FALLENI	S. DORSALIS S. DISTINCTA	CORIXA PUNCTATA	RANATRA LINEARIS	MESOVELIA FURCATA	MICROVELIA RETICULATA	ILYOCORIS CIMICOIDES
OPEN WATER GRAVEL-SILT BOTTOM									
FUNGUS RING AROUND MARGINS									
POTAMOGETON NATANS									
CENTRE OF POND									

sunny and warm; possibly temperature, amount of light, intensity of light, etc., may cause this gregarious behaviour. *H. sahlbergi* was dominant at the other end of this habitat; it is rather unusual to find *H. linnei* and *H. sahlbergi* co-dominant in one habitat. The distribution of certain indigenous species of water-bugs is illustrated in histogram 6.

7. Collections were made from this habitat on ten occasions and eleven species of water-bugs were recorded. Resident species of water-bugs were *Cymatia coleoptrata, Ilyocoris cimicoides, Microvelia reticulata,* and possibly *S. dorsalis* and *S. lateralis*; the remainder of the bugs found were casual immigrants. *C. coleoptera* was the dominant Corixid. This pond was very close to **6**. geographically, but very dissimilar in other respects, as is indicated by the fauna recorded. One corner of this pond had been fenced off and cattle allowed access. This zone had developed cattle pond characteristics, i.e., silty bottom, and almost certainly *S. lateralis* was breeding here. The absence of any number of water-bugs other than *C. coleoptrata* may have been due to the wild ducks which lived on this pond and/or the large population of small *Cyprinus carpio*. During 1952 over 2,000 *C. carpio* were netted from this pond.

9. This was the only stream worked in the survey area and study was continued on this habitat into 1954. Fifteen visits were made and twenty-one species of water-bugs were recorded. Indigenous water-bugs were *Sigara dorsalis, Corixa punctata, Notonecta glauca, Ilyocoris cimicoides, Hydrometra stagnorum, Velia caprai, Gerris lacustris, G. odontogaster* and *Nepa cinerea*. The remainder of the recorded Heteroptera were casual immigrants. *I. cimicoides, N. cinerea* and *N. glauca* are more typical of ponds than streams. The presence of these species and other insects such as *Sialis lutaria* indicate that this stream had long periods when possibly the current was so imperceptible as for pond species to establish themselves successfully. The majority of these pond insects were found amongst the marginal vegetation and detritus. It is possible that such species as *N. cinerea* and *I. cimicoides* were introduced from the large lake in Dyrham Park, being washed down after a heavy storm. Concerning *S. dorsalis*, although indications in April and May, 1954, were that this species would not breed owing to the state of the stream, a collection made in October, 1954, produced two nymphs, one 2nd and one 3rd instar respectively. This is definite proof that the species did breed, but not on the same scale as in 1953. The casual immigrant species of Corixidae were usually found in the southern section amongst the marginal vegetation. *S. dorsalis* when present kept to the patches of *Elodea canadensis* and *Potamogeton cripus*. The Gerrids were exceedingly abundant in May, 1954, but when this habitat was visited in October of the same year, none were found at all. This absence of Gerrids may have been due to the heavy rainfall during the summer drowning all the nymphs. During May, 1954, it was observed

that there was a considerable current running and the adult Gerrids had great difficulty in remaining in control if they were caught in it. Specimens crossing from one side of the stream to the other were observed to hop from the crest of one wave on to the one following. It is very probable that the list of species recorded from this habitat is a record for Herts, especially as regards the Corixids. Surface water-bugs other than Gerrids were very scarce, although both *V. caprai* and *H. stagnorum* bred, they were both very uncommon. This may have been due to the extremely variable current and the occasional thick layers of dust which settled on the stream during periods of stagnation.

10. This pond was visited nine times and twenty-one species of water-bugs were recorded. Indigenous species were *Sigara limitata, S. lateralis, S. falleni, S. distincta?, S. dorsalis, Corixa punctata, Notonecta glauca, Mesovelia furcata, Ilyocoris cimicoides, Microvelia reticulata, Ranatra linearis* and *Plea leachi*; the remainder of the recorded species were casual immigrants. The Heteroptera were all found in well defined micro-habitats, as is illustrated in histogram 7. The majority of the casual wanderers were found in the shallow silty zone. This zone was much frequented by cattle, the degree of pollution was high and the layer of silt considerable. This silty layer seems to be vitally necessary for *S. lateralis* or else it is the colour of the background, Popham (1941, 1943, 1943a, 1944). The combination of *S. limitata* and *S. lateralis* is typical of alkaline habitats and both species prefer this type, with little vegetation; thus it would appear that in **10.** conditions were at their optimum for *S. limitata*. However, the population was only about one fifth of the size of that present in **1.**, where, according to the sampling, conditions were not apparently at their best for *S. limitata*. The finding of *S. dorsalis, S. falleni* and *S. distincta* is rather curious; in alkaline habitats *S. falleni* is believed to replace *S. distincta*. However, according to the sample collected on 22nd November, 1953, *S. distincta* was quite common in the centre of the pond, thus this association has not appeared to follow its normal course. *S. dorsalis* was found nearly everywhere as the survey has indicated. *S. falleni* was certainly more common than *S. distincta* in **10.**, but it is almost certain that *S. distincta* was indigenous to **10.** in addition to *S. falleni* and *S. dorsalis*; thus the distribution was not quite so well defined for this group in **10.** as it was in **1.**, where *S. falleni* was almost entirely absent, due to the high pH ? *Corixa punctata*, although breeding in **10.** was rather scarce, this may have been due to the pollution. *M. reticulata* and *M. furcata* were both very common on and about the *Potamogeton natans*. Gerrids as on 1. were very scarce, but this may have been due to any of the reasons already enumerated. There were virtually no banks to this pond as it was set in a depression in the ground; frequently considerable wave action was observed on windy days. *R. linearis* was more common in this pond than in **2.**,

and more nymphs were found than adults, particularly amongst the *Juncus* detritus. The histogram illustrates in some detail the relative distribution of the more common indigenous water-bugs.

SECTION V

A list of the aquatic and semi-aquatic Hemiptera-Heteroptera, excluding *Saldidae*, recorded from Hertfordshire compared with those from the Barnet Survey.

Species.	Barnet List.	Herts. List.	Species.	Barnet List.	Herts. List.
H. stagnorum	X	X	*C. punctata*	X	X
G. thoracicus	X	X	*C. dentipes*	X	X
G. gibbifera	X	X	*C. panzeri*		X
G. lacustris	X	X	*S. dorsalis*	X	X
G. odontogaster	X	X	*S. lateralis*	X	X
G. paludum		X	*S. fossarum*	X	X
G. najas		X	*S. scotti*	X	X
M. reticulata	X	X	*S. distincta*	X	X
V. caprai	X	X	*S. falleni*	X	X
V. saulii		X	*S. nigrolineata*	X	X
M. furcata	X	X	*S. limitata*	X	X
H. pusillus		X	*S. concinna*	X	X
H. ruficeps		X	*H. moesta*	X	X
A. montandoni		X	*H. linnei*	X	X
I. cimicoides	X	X	*H. sahlbergi*	X	X
N. cinerea	X	X	*C. praeusta*	X	X
R. linearis	X	X	*C. wollastoni*		X
P. leachi	X	X	*C. coleoptrata*	X	X
N. glauca	X	X	*C. bonsdorffi*	X	X
N. viridis	X	X	*M. poweri*		X
N. maculata	X	X	*M. scholtzi*	X	X
N. obliqua	X	X			

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INTERSEXUAL *PLATYCHIRUS MANICATUS* (MEIGEN) (DIPT: SYRPHIDAE)

On the 20th of May, 1956, I netted an intersexual female of this species which was resting on low foliage in my garden.

The insect has the dilated anterior-tarsi of the male, and, instead of the usual black and yellow body-patterning, those two colours appear to have become merged, leaving the abdomen a more or less uniform yellowish-brown. In all other respects, head, genitalia, etc., the insect is a normal female.

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BOOK REVIEW

Die Grossschmetterlinge Mitteldeutschlands, by Dr. Arno Bergmann, 1955. Vol. 5, parts 1 and 2. Geometridae pp. 1-1031; 477 figs. of habitats; 107 black and white and 13 coloured plates of moths. Price £6 15s.

The fifth and final volume of Dr. Bergmann's work is devoted principally to the family Geometridae, which occupies the first 1031 pages of the two volumes. In a short introduction the general characteristics, habits and aberrational tendencies of the family are discussed.

In the systematic treatment of the Geometridae the author generally follows the sequence and nomenclature of Prout in Seitz, Grossschmett. Erde, vol. 4 and supplement; the vernacular names used are those of Spuler.

Far from being just another local list, Dr. Bergmann's work contains a great deal of information concerning the habitats, distribution and life histories of the 336 species that he records from Thuringia, together with useful notes on separating closely related species.

In the treatment of each species, paragraphs are devoted to the times of appearance in different habitats and at different elevations, and to detailed lists of localities showing the distribution throughout the province. The photographs of some typical habitats for each species, together with brief ecological notes on the flora and associated species of Lepidoptera, make a valuable addition. A further paragraph deals with the range of variation of each species, as met with in the province, and twelve new aberrations are described, though there is no indication in the text that the names used are in fact new. The references to the illustrations, which are to be found at the end of the paragraph dealing with variation, would have been better placed with the specific heading.

The illustrations of the moths, principally in black and white halftone plates, are on a generous scale and are designed to show the range of variation of each species; that of *Euphyia bilineata* Linn. portraying 24 examples on plate 222 is especially good, and many illustrations such as those of six specimens of *Epirrhoe alternata* Müller and *E. rivata* Hübner arranged in parallel columns do much to facilitate identification. Unfortunately, not all the plates are well reproduced; the Sterrhinae are particularly poor.

The Geometrid section of volume 5 concludes with a map showing the boundaries of the area studied, a detailed distribution table and an index of vernacular names.

There then follows an account of the origins and development of the flora and Lepidopterous fauna in Central Germany from the Tertiary period to the present day, and the volume concludes with a short supplement to volumes 2-4.

Separate indexes to trivial names, subject matter, new aberrations and authors are included, but oddly a generic index is omitted.

D. S. FLETCHER.

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